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MODERN PLASTICS

FEBRUARY 1947

New Pages from the DUREZ *Diary*

● Turnabout is fair play. Metals have always been a vital factor in the production of plastics. Now here's an instance where the opposite is true. *A Durez phenolic plastic* employed as an integral part of the Budd Induction Heater which, in turn, is used for heat-treating internal diameters of metals, *helps speed metal production.*

In designing this modern bit of electrical ingenuity, Budd Induction Heating, Inc., stopped at nothing that would contribute to its efficient performance. Working with Michigan Molded Plastics, Inc., they accomplished with a Durez special compound the feat of reducing a five-piece terminal assembly to a three-part one that combines the right "pattern" of properties and costs far less to produce.

Here was a situation calling for a really versatile material. Induction heating machines employ high-power, high-frequency currents. Accurate control is vital. The plastic material for such parts as this terminal assembly needs excellent electrical properties in conjuction with high impact strength. This Durez compound . . . one of more than 300 phenolic molding materials developed by Durez laboratory engineers . . . furnished the right combination of properties in addition to impressive savings in time and costly machinery.

This is a typical example of the way the Durez family of molding compounds is simplifying many of today's manufacturing problems. Heat resistance, dielectric strength, non-resonance, and impact strength, all inherent in Durez plastics, may be the answer for you. Durez laboratory engineers are ready to work on any of your problems that the phenolics may solve. Durez Plastics & Chemicals, Inc., 52 Walck Rd., North Tonawanda, N. Y.

PHENOLIC PLASTICS THAT FIT THE JOB

Catalin adds Color-Magic to the New Parker "51" *Magic Wand* Desk Sets

Here is a design for the Parker *Magic Wand* Desk Set that is daring in its simplicity! Shorn of all frills, clean-cut, massive and strong, it becomes the perfect masculine desk appointment. And to add the distinguished touch it is *beauty-based* on Catalin — the colorful, lustrous *gem of plastics.*

Catalin's inherent depth and richness of color enable it to fit naturally into the most luxurious surroundings. Like all fine things, it brings with it a pride in ownership and an aura of gracious living. Catalin in any of its forms — transparent, translucent or opaque — when adapted to radio cabinets, desk and table accessories and many other types of decorative items, gives them a charm . . . and a *desirability* that is irresistible.

Highly advanced Catalin casting techniques have broadened the horizon of designers and product engineers, permitting them to work freely in all three dimensions and bringing new flexibility to plastics applications.

Plan to add the distinguished and appealing touch of Catalin to your next new product idea. Our service staff will be glad to assist you. Inquiries invited.

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE • NEW YORK 16, N. Y.

Pen Base designed by Moholy-Nagy for Parker Pen Company and fabricated by Creative Plastics Corp.

CATALIN
THE GEM OF PLASTICS
Catalin

CAST RESINS • LIQUID RESINS • MOLDING COMPOUNDS

MODERN PLASTICS

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Not Non-Skid... but Non-Scuff!

THERE'S no guarantee on the seat of the redcap's pants. But it's a safe bet that the good-looking luggage will come through this spill in perfect shape. That's because it's covered with a new kind of material, calendered from one of the GEON polyvinyl resins. Almost indestructible, this material also resists aging, sunlight, heat, cold, oils and acids, mildew, and most other normally destructive factors.

These and many other important properties may be compounded into literally hundreds of products, for home and industry, that may be made from GEON. GEON can be pressure or injection molded, calendered or cast into sheet or film. In solution or latex forms it can be applied as coatings for fabrics and fibres of all kinds as well as for paper and cardboard. Products made from GEON may be flexible or rigid, clear or opaque, brilliantly or delicately colored.

Thanks to its versatility there are applications for GEON in *every* home—*every* industry—just as there are for other B. F. Goodrich Chemical Company products such as HYCAR American rubber, KRISTON thermosetting resins, GOOD-RITE brand chemicals, and many other products of the present and the future. While we make no finished products we'll be glad to work with you on any special problem or application. Just write B. F. Goodrich Chemical Company, Dept. O-2, Rose Bldg., Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

Luggage is another interesting application for GEON polyvinyl raw materials

Luggage covered with Pantasote's Pantex

B. F. Goodrich Chemical Company

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Molded Plastics?

MIND IF WE LOOK OVER YOUR SHOULDER?

PERHAPS you're already playing around with ideas and sketches for that new molded plastic part. If you are . . . may we make a suggestion? Right now . . . while your plans are still in the formative stage . . . is the time to discuss the job with your plastics molder.

Why? Because there are a lot of things that should be taken into consideration before you go too far . . . such things as materials and their molding "habits" . . . moldability of the part . . . mold design . . . molding techniques. And each has a distinct bearing on the way your part should be designed.

That's why we suggest that you call in a CMPC Service Engineer. Let him look over your shoulder . . . let him make a few pertinent suggestions and give you the benefit of this organization's broad experience in plastics (over a quarter century of it). It's the sensible, practical, and economical way to approach any molded plastics job.

So . . . why not discuss your plans with a CMPC Service Engineer . . . now? There's no obligation . . . and you'll find it time well spent.

CHICAGO MOLDED PRODUCTS CORPORATION

1046 N. Kolmar Ave. Chicago 51, Illinois

Representatives in principal industrial centers

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The buyer is reaching for his crown

Junk is definitely out!

The only junk that will be bought in 1947 will come from the scrap piles and that's where a lot of plastics are going to end up unless there is a reformation.

The subject of eliminating the unfit and preparing for a buyer's market has been repeated in this column so often that we have been accused of having a one-track mind. But proof is now evident that the warning has gone unheeded; the thunder preceding the storm is beginning to roll.

A good example of customer attitude was exhibited at the housewares show in Atlantic City, where manufacturers ran head-on into stiff buyer resistance—so stiff that out of an anticipated 9000 registrants, only 3500 showed up. Those who were there insisted on quality and branded merchandise only. They were persistent in their determination to turn away from any and all merchandise that was represented as "just as good as so and so." Buyers are now insisting on the genuine article.

At the furniture show in Chicago, buyers again demonstrated their prejudice against "ersatz." They skipped exhibitors whose furniture showed signs of inferiority. They came to look only for hard-to-get-goods, and one report stated that lamps formerly selling at $89.50 were being offered in comparable quality at $59.50.

This buyers' turnabout is especially applicable to plastics because, justly or unjustly, the industry derived a reputation for providing substitutes during the last five years. Many of them were better than the original, but in many cases the customer thinks first of the substitute and second of the quality. The natural psychological reaction is to douse the substitute.

The first thing necessary to eliminate this public misunderstanding, is to abolish all junk applications. If the needed raw materials, such as plasticizer, can't be obtained to give plastics its proper characteristics, it would be better not to make the product. We recently observed a set of doll furniture smartly designed in plastic. But workmanship was as sloppy as almost anything we've seen in plastics—sharp edges, rough gates, an unfinished job in every respect. We saw a high-quality, $4.00 hair brush whose handle had snapped off when the brush was accidently pushed from the top of a child's dresser, only two feet from the floor. A whisk broom holder that was supposed to be movable couldn't be budged because it was warped, and the brush which had been folded into it couldn't be used. We maintain that these disgraceful happenings are a menace to the entire industry. And the sad commentary is that every one of the items named above came from a highly respected manufacturer with a long record in the industry.

However, don't ever blame your competitors in this industry for poor workmanship until you have taken steps to clean your own house.

Plastic Vision UNLIMITED

Style Your Product Right with Grigoleit

Tomorrow is a world of PLASTIC promises come true! Sparkling, colorful, gleaming white or jet black . . . plastic parts by Grigoleit are your assurance of the ultimate in beauty in your product.

But not beauty alone! Durability; accurate, firm and smooth blending of metal and plastic are qualities you'll always find in Grigoleit trim.

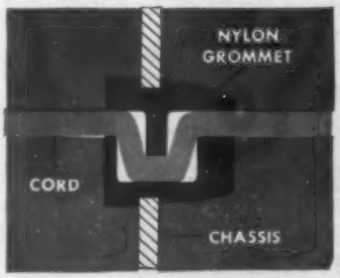
We invite you to make use of our wide experience and complete facilities . . . our increased capacity for injection molding of thermoplastic material.

Our latest catalog showing a complete stock line of handles, knobs, pulls, etc., is available upon request.

The GRIGOLEIT COMPANY, Decatur 80, Illinois

NYLON GROMMET WITH A VISE-LIKE GRIP

New safety for appliances . . . molded from a Du Pont plastic



HOW NEW GROMMET WORKS

Grommet is two-piece assembly. Wire is placed across base piece. Top section is squeezed into assembly with pliers, locking wire in a safe hairpin turn. Grommet is then snapped into hole in appliance chassis. (Nylon grommet molded by Mack Molding Co., Inc., Wayne, N.J., for Heyman Manufacturing Co., Kenilworth, New Jersey.)

WELCOME NEWS for appliance manufacturers, underwriters and consumers is a new strain-relief grommet (or bushing) molded from Du Pont nylon.

Anchored into the chassis of the appliance, this mighty little nylon grommet keeps a tight, safe grip on lead-in wire. It absorbs the stresses of tugs and twists . . . protects connections against stripping, short circuits and moisture . . . adds a safety feature and a sales boost too. Nylon outpointed all other grommet materials tested by the manufacturer. Under heat test, for example, the nylon grommet withstands temperatures up to 400°F. It is economical to install . . . and it lasts the life of the equipment.

Want to improve an old product . . . design a new one? Look to nylon . . . and other Du Pont plastics . . . for a lift to success and more sales. Write for literature. E. I. du Pont de Nemours & Co. (Inc.), Plastics Department, Room 362, Arlington, New Jersey.

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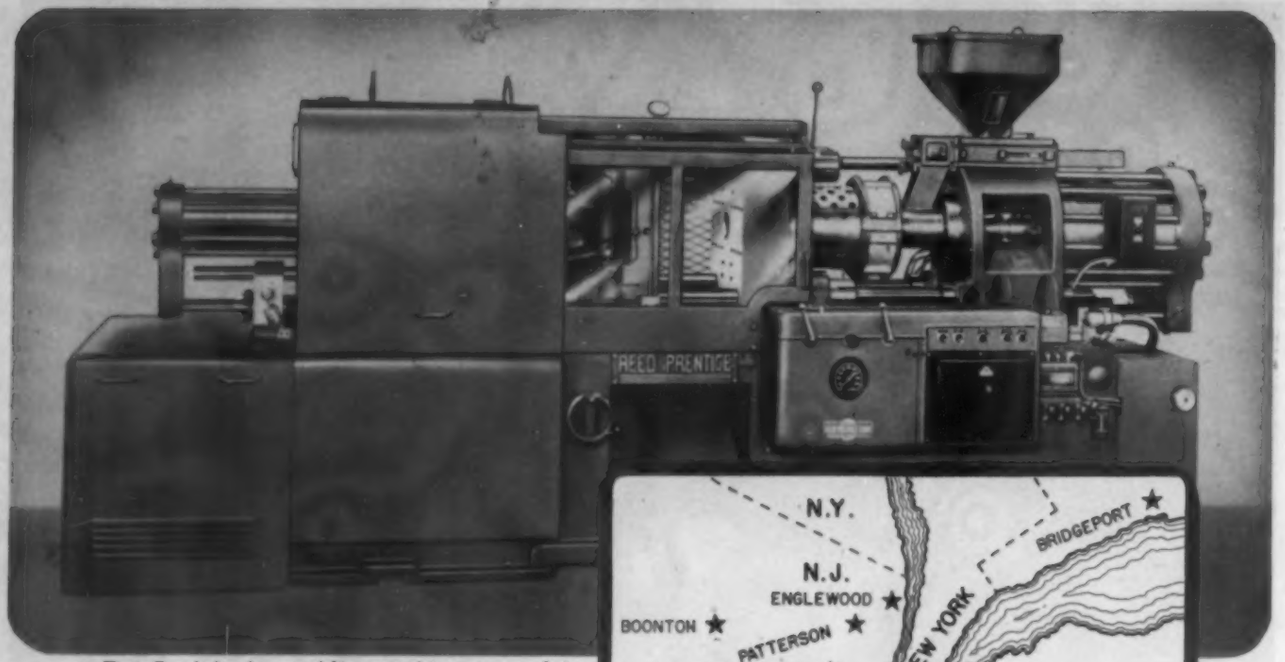
Plastics
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY



10D-8 Oz. injection molding machine—one of the most popular models in the Reed-Prentice line.*

OVERWHELMING ACCEPTANCE . . .

Overwhelming acceptance by experienced molders everywhere testifies to the tremendous leadership of Reed-Prentice plastic injection molding machines. In the New York industrial area alone, over 270 installations are giving uninterrupted, trouble-free service.

Whether the installation is a single machine or a large number — molders find that Reed-Prentice injection machines turn out accurate molded parts, can be depended on for continuous, every-day production and are economical to operate under all conditions.

One of the outstanding features of the Reed-Prentice machine that counts with molders is its unvarying control — allowing an even temperature and the application of constant pressure on the plunger and material — resulting in perfect filling of the mold without sinks, flash or scratches.

*The complete Reed-Prentice line includes models of 4, 6, 8, 12, 16 and 22 Oz. capacities. Such widespread acceptance is definite proof of superiority. Write for mold and machine information, addressing inquiries to Dept. D.

THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

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WORCESTER MACHINES MASS., U.S.A.

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CLEVELAND OFFICE:
1213 W. 3rd St., Cleveland 13, Ohio

LISTEN

Are your products expected to serve in varying conditions of temperature and humidity . . . to pass the test of toughness and stability in practically every type of climate?

Here is an injection-molded radio housing that has maximum toughness and form retention—at north pole temperatures or in the tropics. It is made of CELCON—a Celanese* cellulosic thermoplastic!

Celcon is a war tested plastic. It has met strict government specifications written for global conflict. It will meet yours.

If you know in advance *all* the possibilities of the plastic you intend to specify, chances are, you can effect refinements in your product's design you hadn't thought feasible. It is the job of the Celanese Technical Service Staff to bring these to your attention before your plans are drawn—to furnish you with previews of performance that will suggest improvements, economies and production shortcuts while your product is in the blueprint stage. Write: *Celanese Plastics Corporation*, division of Celanese Corporation of America, 180 Madison Avenue, New York 16, N. Y., producers of *Celcon*†, *Lumarith**, *Forticel**, *Celluloid**, *Vimlite**.

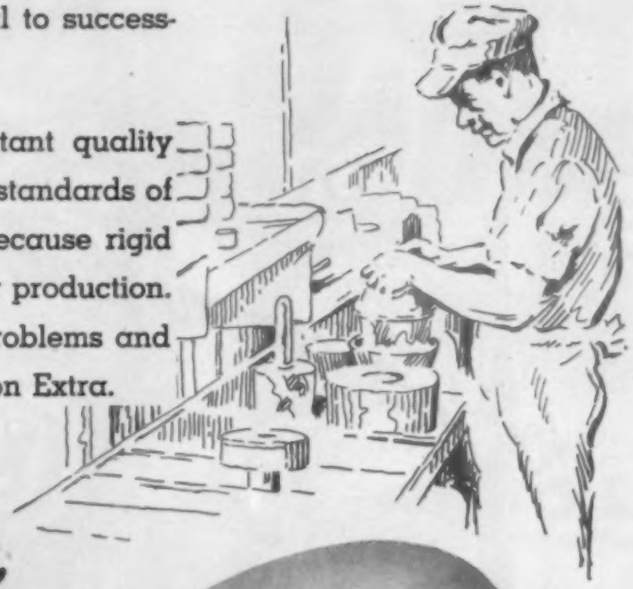
*Reg. U. S. Pat. Off. †Trademark

Celanese* Plastics

Successful Lamination Starts With Fabric Uniformity

Even penetration of resins, so essential to successful lamination, starts with fabric uniformity.

Mt. Vernon Extra fabrics have this important quality because they are spun and woven to rigid standards of tolerance from top grades of cotton and because rigid laboratory controls guide every step in their production. For fabrics that will minimize processing problems and aid successful lamination, specify Mt. Vernon Extra.



uniformity makes the big difference

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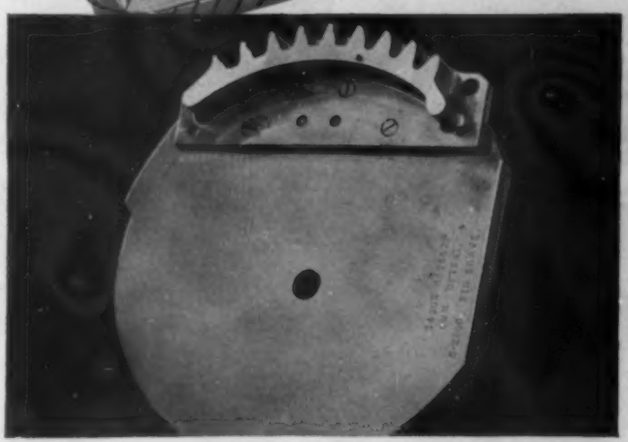
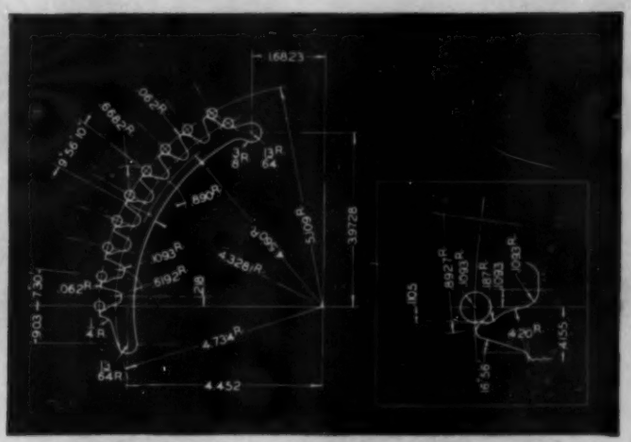
How to Mill this Shave Punch Complete in 60 Hours





1 **FAST!** 6 hours for layout and setup. 25 hours rough cut. 29 hours finish cut. Material: High carbon, high chrome steel. Total: 60 hours blank stock to finished shave punch. That's typical 2D Rotary Head Milling Machine performance.

2 **DIRECT!** Intricate shapes of punch teeth milled direct in workpiece. No fussing with models or templets. Blueprint was the only guide the operator had or needed. Precision control of all combinations of cutting movements did the rest.

3 **ACCURATE!** Single setup held chance of error to minimum. Operator relied on built-in precision, control and measuring devices — had no difficulty holding tolerance to +.0005"−.0000".

Photos and information Courtesy of National Cash Register Co.

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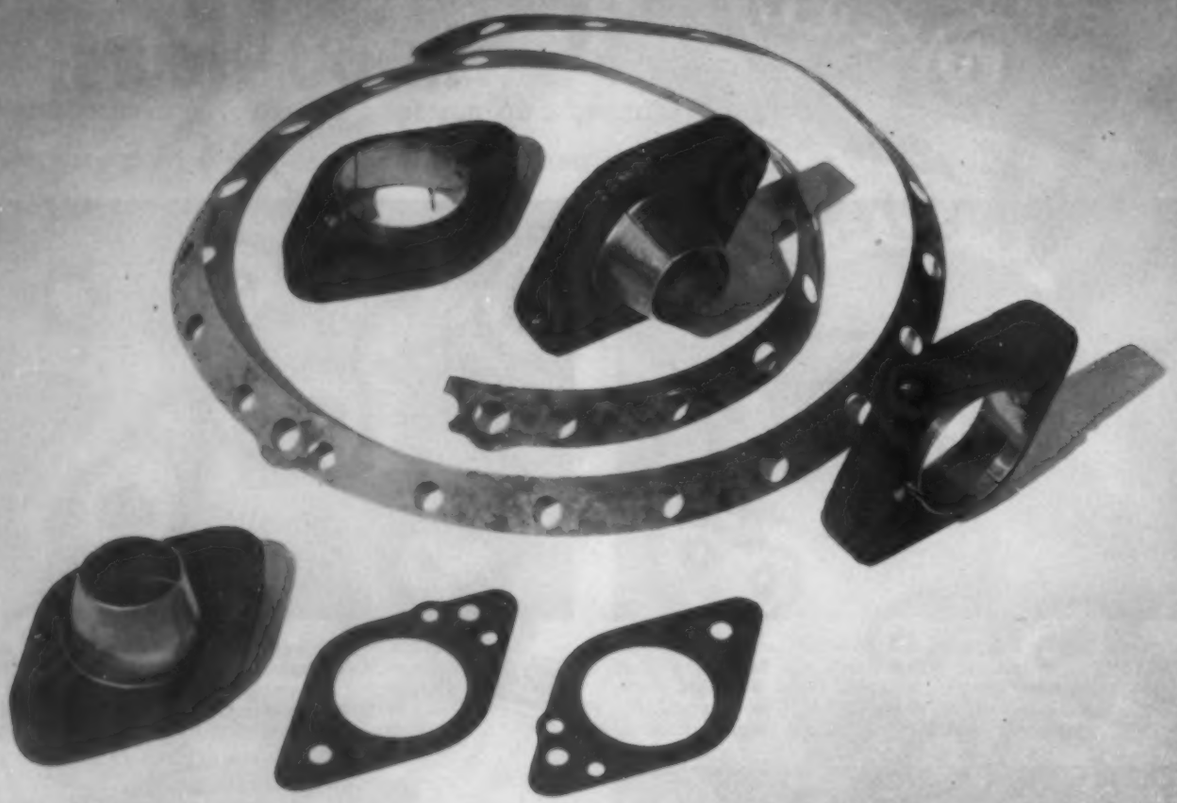
PLASTICS



INDUSTRIAL RESINS

Tough, heat-resisting gaskets produced from DURITE resins by Detroit Gasket & Manufacturing Company provide durable seals for the prevention of gasoline, oil and grease seepage in various automotive assemblies. We invite your inquiries on your plastics problems.

DURITE PLASTICS INCORPORATED • 5000 Summerdale Ave. • Philadelphia 24, Pa.

Faster-Simpler-QUIET!

The New H-P-M All-Hydraulic 4 oz.

Complete information on the new H-P-M 4 oz. injection machine is contained in Bulletin 4701. Write us for your copy.

Here's the newest injection machine in the plastics industry—and the simplest. It's the first *all-hydraulic* injection machine with a one-pump system. This means there are less things to go wrong—fewer moving parts to wear or break—fewer adjustments. You'll have less maintenance—and simpler, safer operation.

But that's just *one* advantage of this new H-P-M unit. H-P-M design gives you fast plasticization with two zone electric heat—positive mold sealing with straight-line hydraulic mold clamp—fast die-change-over—round-the-clock high-speed operation.

When you buy H-P-M machines, you're buying 70 years' experience in hydraulics—and a power system built by H-P-M engineers. Responsibility is undivided. "All-Hydraulic" units are built in standard sizes of 4, 9 and 16 ounce capacity. Investigate now, while deliveries are still favorable. An H-P-M engineer will gladly explain their money-saving production features—as applied to your work.

THE HYDRAULIC PRESS MFG. COMPANY, Mount Gilead, Ohio, U. S. A.

Branch Offices in New York, Philadelphia, Cleveland, Cincinnati, Detroit and Chicago. Representatives in other principal cities

HPM

All-Hydraulic Self-Contained **Injection Machines**

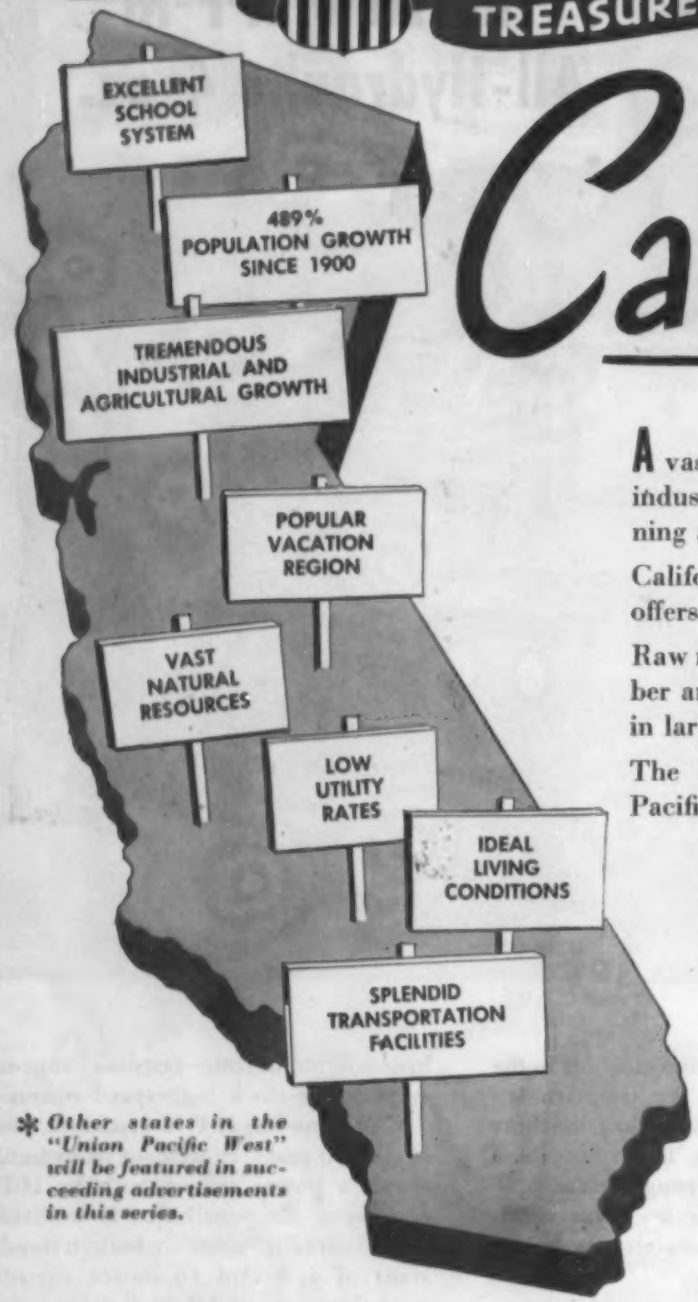
FOR MOLDING THERMO-PLASTICS

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

UNION PACIFIC

TREASURE MAP OF INDUSTRY

California *



A vast opportunity for development awaits industrial and commercial concerns planning a west coast location.

California's population, steadily increasing, offers a tremendous easy-to-reach market.

Raw materials . . . minerals, petroleum, lumber and agricultural products are available in large quantities.

The Golden State is ideally located for Pacific export trade.

Hydro-electric power, nearby natural gas and oil fields, a mild all-year climate are industrial advantages.

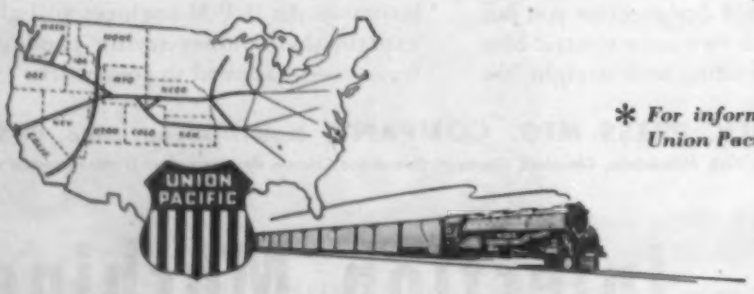
Freight transportation facilities are unsurpassed. California is one of eleven western states served by the Union Pacific Railroad.

For industrial expansion, consider California. For dependable, all-weather transportation, to or from the West, we suggest—

be Specific – say "Union Pacific"

* *Other states in the "Union Pacific West" will be featured in succeeding advertisements in this series.*

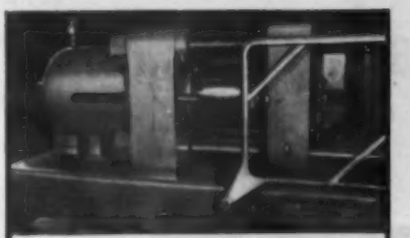
* *For information address Industrial Department, Union Pacific Railroad, Omaha 2, Nebraska.*



UNION PACIFIC RAILROAD

THE STRATEGIC MIDDLE ROUTE

LOOK FOR THESE FEATURES



STRAIGHT HYDRAULIC CLAMP

The straight hydraulic clamp assures positive clamping pressure. A separate holding pump maintains this pressure during the entire holding period. With the long stroke and opening provided deeper pieces can be molded. The large diameter hydraulic ram gives maximum support to die, keeping deflection to a minimum.

SIMPLE DIE SET UP

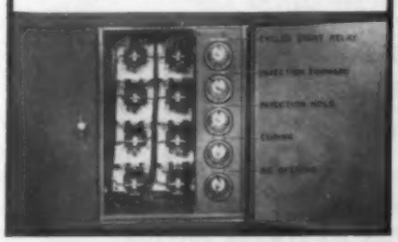
Mold set up time with the straight hydraulic clamp is reduced to a minimum. Full clamping pressure can be exerted at any point in the stroke requiring no machine adjustment to accommodate molds of different thicknesses. The mold can be closed under zero pressure with the inching valve at any desired speed, eliminating the possibility of damaging the molds in setting up.

MATERIAL FEED

The feeder is of the self-compensating type and is provided with micro-adjusting knob, permitting accurate regulation. The feeder slide receives material from the hopper and discharges to the heating cylinder through the feed bushing. The amount of charge depends on the length of stroke of the slide, which is controlled by the micro-adjustment.

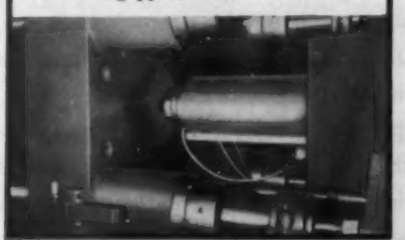
CYCLE CONTROLS

A selection of manual, automatic single cycle, or full automatic operation is possible by selector switch. Regardless of cycle selected swinging safety gate must be closed to operate machine, giving protection to the operator. Five individual motor driven timer units control the cycle when operating on automatic single cycle or full automatic control.



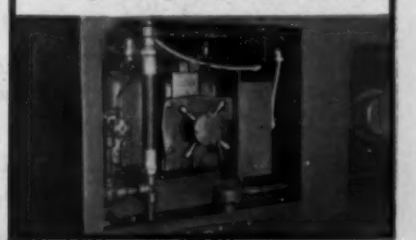
HEATING CYLINDER

Heating cylinder is of the self-sealing type fitted with fully streamlined torpedo allowing free flow of material passage through the cylinder. Serpentine heaters and zone heating control assure even controlled heating of the cylinder. Thermocouples are connected to the cylinder at different zones, each connected to a Wheelco indicating pyrometer.



INJECTION SPEED CONTROL

Speed control on 8 ounce model is by means of a flow control valve. On the 12, 16 and 28 ounce models injection speed is controlled by adjusting the volume control, which is an integral part of the radial piston pump. With this control the pump delivers a definite volume at any desired pressure and is adjustable from maximum injection speed steplessly down to zero.



Watson-Stillman Horizontal Injection Molding Machines are made in 8, 12, 16 and 28 ounce capacities. Literature is available.

2129

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HYDRAULIC MACHINERY DIVISION

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MACOID will help you put your plastics designs into production. MACOID plastics engineers are experienced in determining the best material for each job, the proper method of manufacture, and the correct design of dies for low-cost, high quality products.

The washing machine gasket shown above, manufactured for Launderall (built by F. L. Jacobs Co.), is typical of jobs engineered by MACOID. Specially developed in the MACOID laboratory, it combines a plastic shell with a sponge rubber insert. The result is a soft, flexible, pure-white ring that provides the perfect seal required. The gasket will not stain, is not attacked by alkalis or abrasives in the soap.

MACOID will help engineer your product, too. You are under no obligation when you consult MACOID Engineers, who will be glad to give you any possible assistance.

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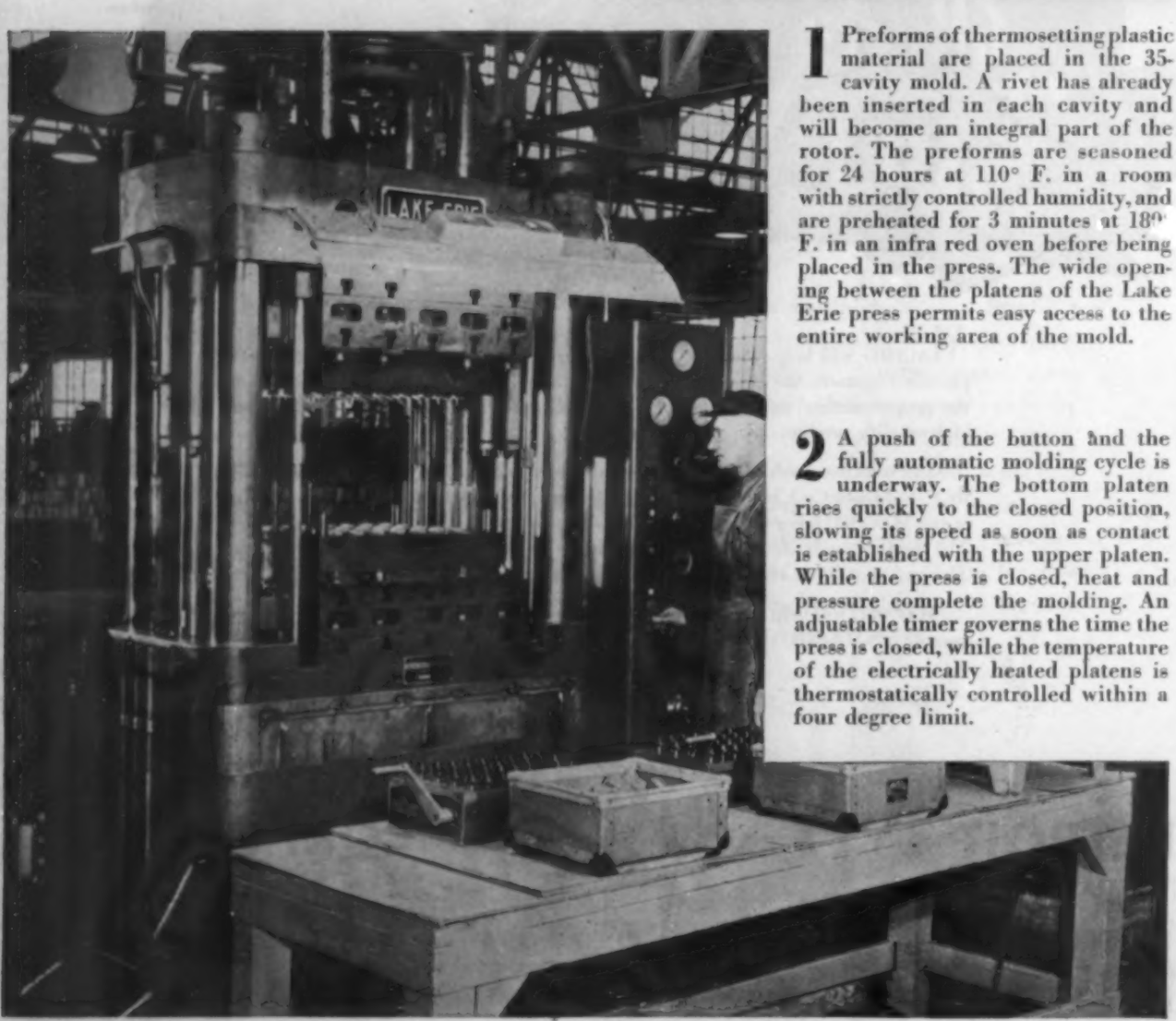
EXTRUSION AND INJECTION MOLDING

How the Ford Motor Company

Rotors are turned out at the rate of more than 150 per hour on this 300-ton automatic Lake Erie Hydraulic Press at the Rouge Plant.



1 Preforms of thermosetting plastic material are placed in the 35-cavity mold. A rivet has already been inserted in each cavity and will become an integral part of the rotor. The preforms are seasoned for 24 hours at 110° F. in a room with strictly controlled humidity, and are preheated for 3 minutes at 180° F. in an infra red oven before being placed in the press. The wide opening between the platens of the Lake Erie press permits easy access to the entire working area of the mold.

2 A push of the button and the fully automatic molding cycle is underway. The bottom platen rises quickly to the closed position, slowing its speed as soon as contact is established with the upper platen. While the press is closed, heat and pressure complete the molding. An adjustable timer governs the time the press is closed, while the temperature of the electrically heated platens is thermostatically controlled within a four degree limit.

produces Distributor Rotors...

3 When the molding cycle is completed—the press is closed for 5 minutes at 300° F.—the Lake Erie Press automatically opens to its full width. The operator then removes the molded rotors and flash or excess material. Within minutes after the molded rotors are removed from the Lake Erie press, they are placed in the ingenious [illegible]xture shown in 4.

4 The rods on which the rotors are being mounted are exact duplicates of the rods on which the rotors will be assembled in the distributor. In cooling to room temperature, the rotors shrink onto the rods and are held to within 2/10,000 of an inch of the exact fit required for installation in the Ford engine. A turn of the crank strips the cooled rotors from the rods.

Various stages in the manufacture of Ford rotors. At the left is the preform of thermosetting plastic material and the rivet which is integrally molded in the rotor. Next is the molded rotor with steel spring and brass tongue ready for assembly. At the right is the completed rotor. The pencil gives an idea of the small size of the parts and the need for precision presses and molds in manufacturing this vital Ford part.

● *Lake Erie Hydraulic Molding Presses, Laboratory and Test Presses are fully illustrated and described in Bulletin 544 just off the press. Write for a copy of this latest information today.*

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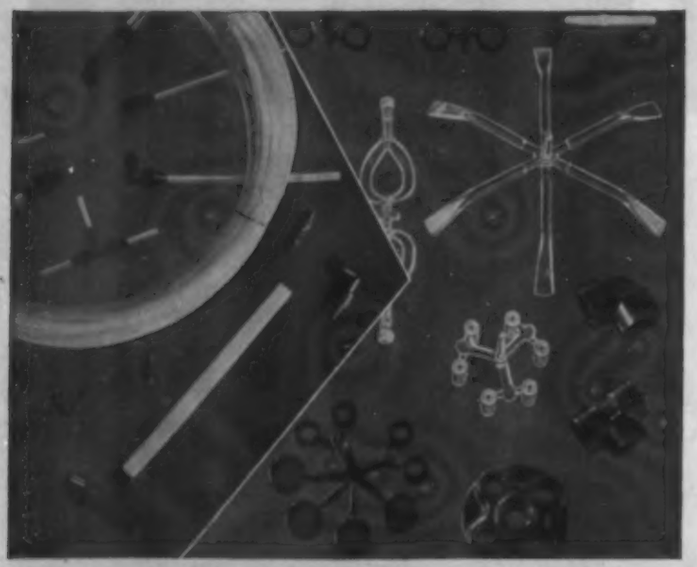

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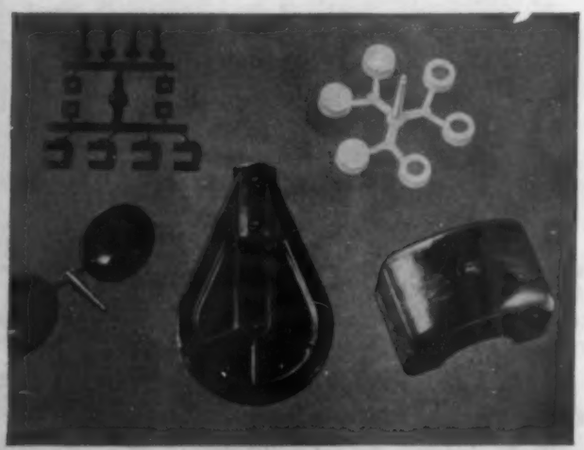
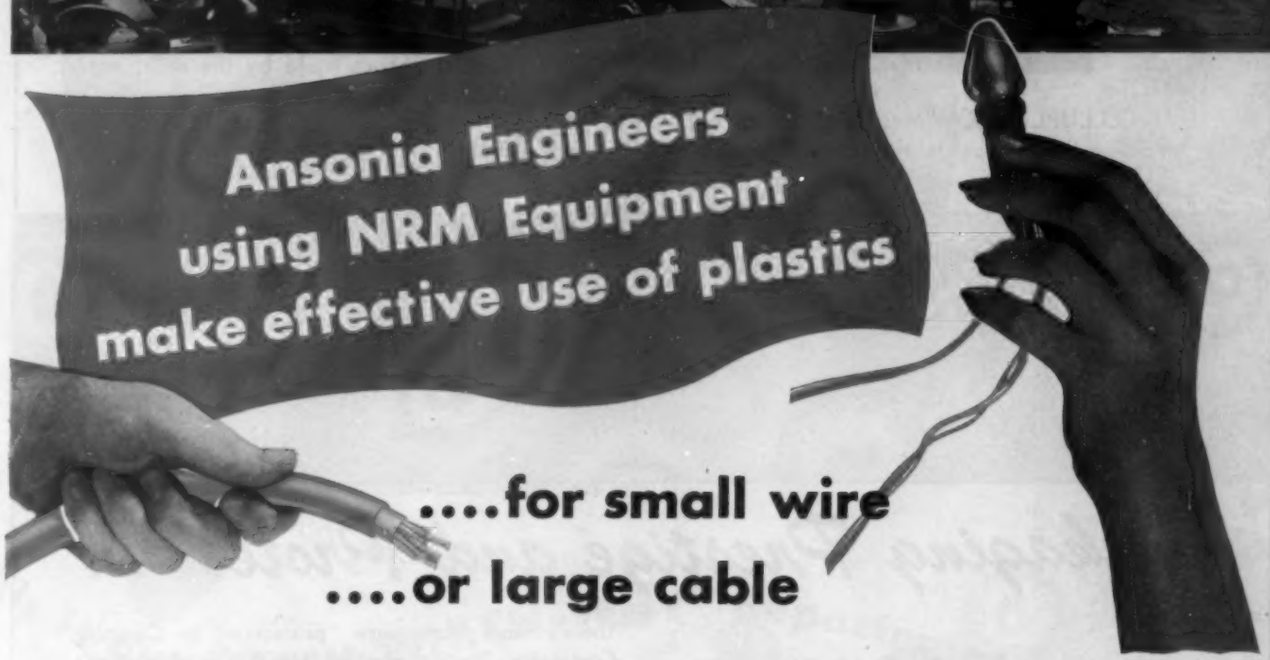


ST. LOUIS PLASTIC MOULDING CO.
SAINT LOUIS 8, MISSOURI

Ansonia Engineers using NRM Equipment make effective use of plastics



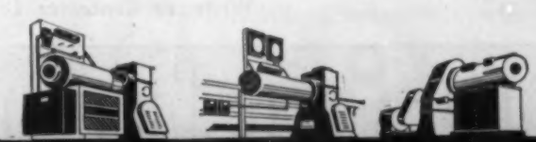
....for small wire
....or large cable

IN the modern plant shown above, Ansonia Electrical Division of Noma Electric Corporation uses NRM plastics extruders and takeup units to cover wire and cable in a wide range of sizes. Depending on diameter, wire can be insulated at speeds up to 1200 feet per minute.

These units give Ansonia engineers the precision control they require to produce uniformly high quality wire for the many markets they serve.

The NRM 2½" plastics extruder offers unique compactness, clean design, and the ability to cover wire or cord at high speed. The takeup and cooling unit is a simplified, compact method of hauling-off, cooling, and reeling plastic covered wire.

There are NRM plastics extruders, takeup units and conveyor equipment to meet your specific requirements. For full information on the units best suited to your needs, just send us a brief outline of your problem.



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PERHAPS you are not familiar with the remarkable progress that has been made in the field of rubber and plastics water dispersions. It's entirely possible that right now you may be struggling with a problem that could be simply solved by the use of one of these materials.

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NATURAL AND SYNTHETIC RUBBER LATICES, WATER CEMENTS AND SUSPENSIONS

More and more molders are saying:

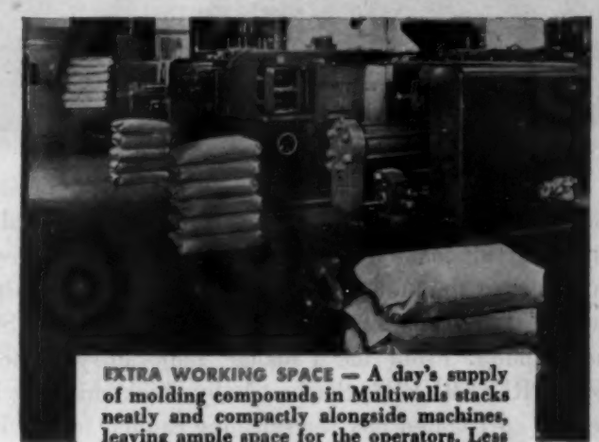
"There are many advantages to MULTIWALL PAPER BAGS as containers for molding compounds"

EASY TO OPEN — Just cut looper thread at valve end of bag and pull out as shown. Then rip tape off. This leaves bag wide open, means faster emptying, less chance for contamination, fewer rejects.

EASY TO HANDLE — Multiwalls' convenient 50 lb. size is a complete charge for many molding machines. Handling is easier too; one man can stack Multiwalls as fast as two men can handle equal weight in drums.

MULTIWALLS mean real savings to molding shops—in material costs, space and labor. In addition, they bring actual cash returns because they can be readily sold to local used bag dealers.

Ask your supplier to ship your next order of molding compounds in multiwall paper bags. Their multiple advantages provide greater economy and greater convenience.



EXTRA WORKING SPACE — A day's supply of molding compounds in Multiwalls stacks neatly and compactly alongside machines, leaving ample space for the operators. Less storage area is required because Multiwalls take 15%-20% less space than rigid containers — and *100* empty bags require only 2 cu. ft.

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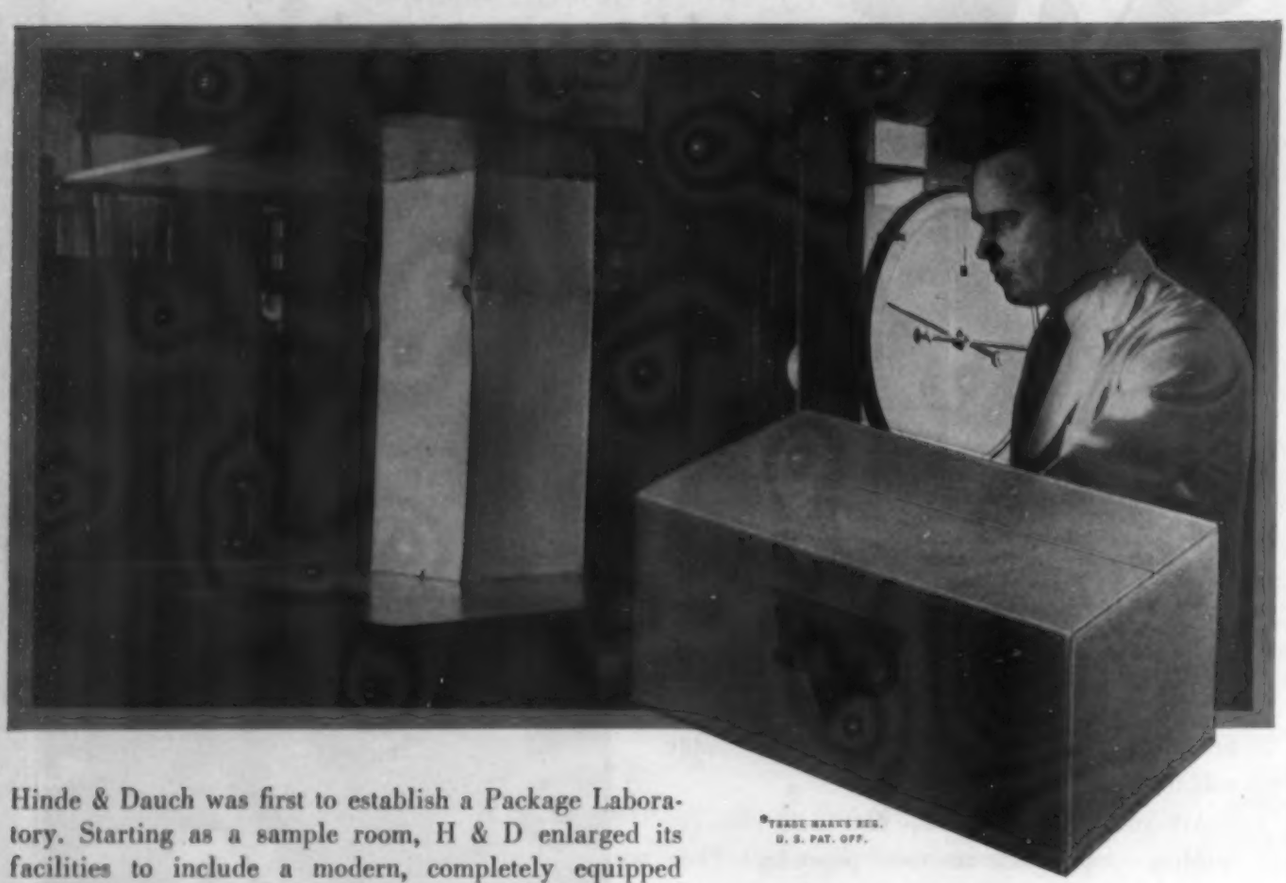
first to establish a PACKAGE LABORATORY



Hinde & Dauch was first to establish a Package Laboratory. Starting as a sample room, H & D enlarged its facilities to include a modern, completely equipped Package Laboratory in its factories in the United States and Canada. From the Package Laboratory came the LIFE PRESERVER*, the first baby chick shipping box; the first corrugated box for shipping canned foods; PRE-PAK*, the first unit package. These and many other H & D "firsts" were developed in the Package Laboratory where scientific construction and design are employed to increase packaging efficiency and reduce packaging costs. The Hinde & Dauch Paper Company, 4701 Decatur Street, Sandusky, Ohio.

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Give a novice ice skates, let him loose on the ice and *watch* the results. Give the same skates to an expert and watch him glide over the same ice. What's the difference? It's all in knowing how.

Given the same powder, mold and machine, an experienced molder will turn out a product that bears no resemblance to its novice-produced counterpart. Pyro Plastics Corporation's staff of experts—engineers, designers and technicians—coupled with it's modern production methods and affiliated merchandise facilities, can help you glide over the most difficult plastics problem. Profit by our experience.

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under rugged wear

with PENACOLITE

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Manufactured by Gad-a-boats Novelty Division, Portland, Maine, the toy bus shown here was made of ½" plywood and ¾" native pine bonded together with a PENACOLITE ADHESIVE. It will support the weight of a 200-pound man and has been tested to prove that it will withstand extreme battering of child playing. After 16 months of continued childish abuse the original bus is still as solid as when first made.

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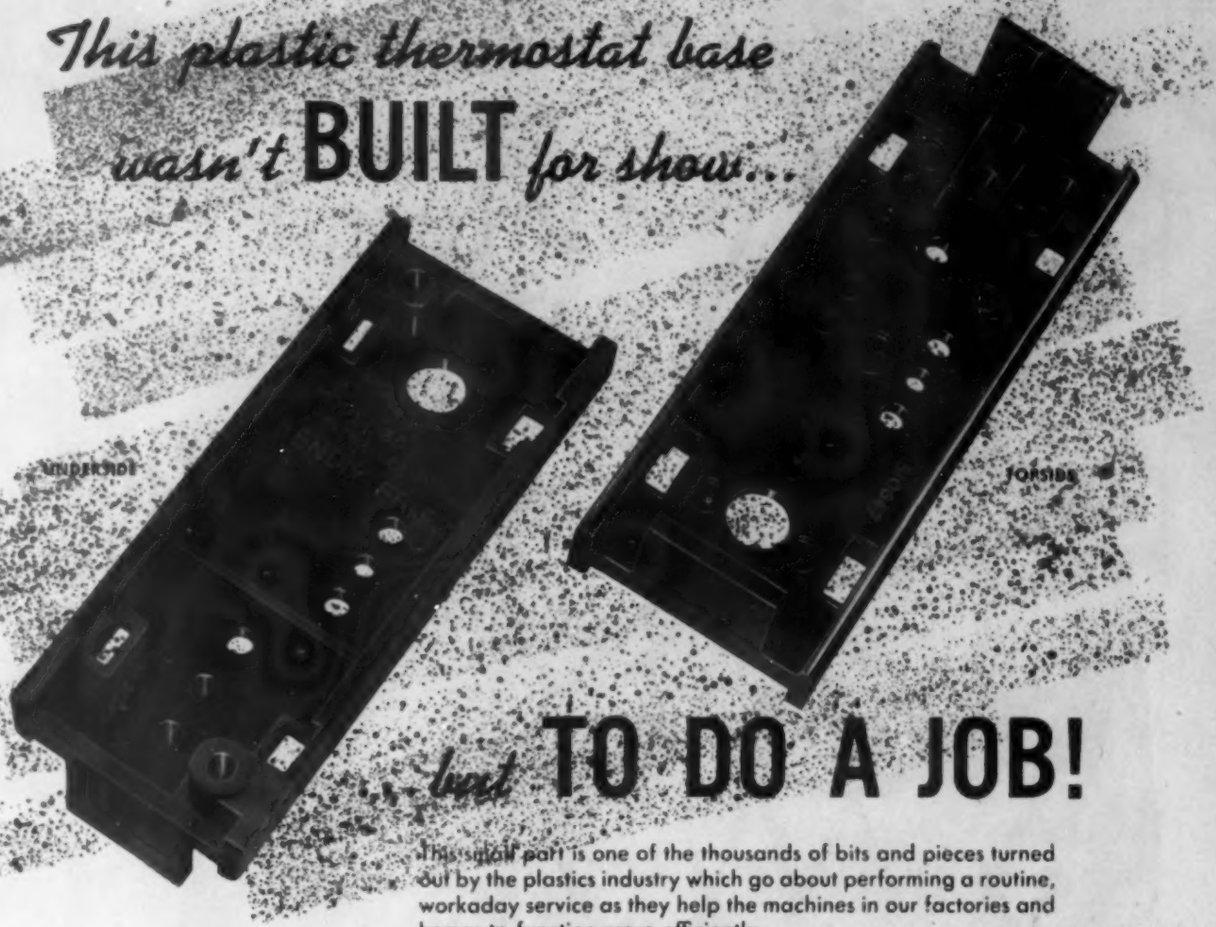
This plastic thermostat base wasn't **BUILT** *for show...*



...but **TO DO A JOB!**

This small part is one of the thousands of bits and pieces turned out by the plastics industry which go about performing a routine, workaday service as they help the machines in our factories and homes to function more efficiently.

Like many of the others, it doesn't show. The experience and know-how that went into its production do not show either. By today's standards it is a routine, run-of-the-mill plastics application. So study it for a moment and see how far the industry has progressed. Here are bosses, shoulders, lettering and thin-walled sections, and both round and rectangular holes — all molded to close tolerances in an enclosed four-cavity, semi-automatic mold. *A single operation* . . . fast and economical for no supplementary finishing is required.

Routine? Yes . . . to the men of Consolidated, but only because they have kept apace with plastics progress, gaining the know-how that comes through years of experience with knotty molding problems.

Whether your new plastics project is one for show or for hidden service . . . routine, or one to "stump the experts" . . . the Consolidated staff brings you a custom molding service custom-tailored to the need. Inquiries invited.

Thermostat base shown molded for Friez Instrument Division, Bendix Aviation Corp.

Material: Consolidated "Arcolite" #4929—general purpose wood flour phenolic.

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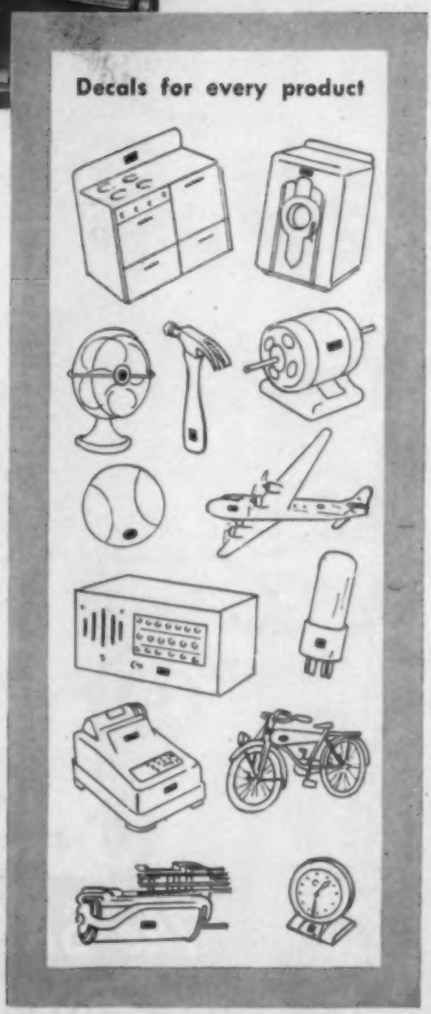

Conditions under which this "Divine" buffer operates demonstrate Meyercord quality.

Double-duty, low-cost Meyercord Decal nameplates *advertise* as they *identify*. They offer full color for quick brand recognition! Divine Brothers Co., Utica, N.Y., has used them for years as trademarks of colorful distinction on quality buffing wheels. They resist vibration, fumes, moisture, abrasion, acids, wear and constant use.

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Mottletone is an acrylic that is *mottled through and through.* In addition, it possesses the color characteristics of cast phenolics, machines easily, has marbleized appearance, and retains its glistening, lustrous polish.

Whether you are already manufacturing a product or contemplating a new one, the use of Mottletone means greater sales for you in these ways: 1—Its striking colors attract customers. 2—Its rich onyx-like finish has the expensive appearance that sells. 3—Its durability provides the satisfying wearing quality that puts your product in demand again and again.

For further information on Mottletone write to

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RIGHT for utility

RIGHT for beauty

GLEAMING STYRON . . . the *quality* touch in your beautiful new refrigerator . . .pride of your lovely kitchen. Brilliantly white . . . so handsome, too, in colors. And wonderfully practical, this fine Dow plastic. Styron *keeps* its rich appearance, gives lasting service in such parts as control knobs, crisper fronts, freezer doors, shelf supports, drip trays, escutcheons. In your refrigerator, or gracing its gleaming exterior, Styron is the *dependable* plastic. Styron—in clock cases, refrigerator parts, or toys or combs or utensils—is *right* for you.

PLASTIC DIVISION

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Ontario

DOW Plastics

Beauty and Utility...

PLASTICS, metals and plastic-metal combinations are opening new fields in design as illustrated by this assembly made by Auto-Lite. The spoke retainer, made of thermo setting plastic, carries chrome-plated stampings at each end and hidden inserts to hold the jewel-like, three dimensional, thermo-plastic center horn button. Another example of craftsmanship combined with utility . . . all available under one roof at the Bay Manufacturing Division of Auto-Lite.

THE ELECTRIC AUTO-LITE COMPANY

Detroit 2, Mich. *Bay Manufacturing Division* Bay City, Mich.

Auto-Lite

IT'S SOLID

This is a picture of the frame of a DE MATTIA injection molding press.

It forms a giant 24-inch grip of solid steel on both sides of the press which holds the tremendous pressures of the DE MATTIA machine in check—over 400 tons.

This is just one of the sound construction features which makes the DE MATTIA injection molding press a standout in the plastics industry. No detail of engineering has been ignored—no construction feature has been omitted to make the DE MATTIA press the finest-performing injection machine possible.

And years of press-building experience are behind DE MATTIA designs. That is why DE MATTIA presses are famous in the plastics industry for their performance.

Exclusive DEMATTIA *Features**

1. Actual die-clamping pressure over 400 tons.
2. Complete injection time two seconds.
3. Solid plate frame.
4. Plasticizing capacity: over 130 lbs. per hour.
5. Patented rolling action toggles non-wearing.
6. One piece welded steel base.
7. Injection pressures controlled to 30,000 lbs.
8. Hydraulic adjustment for die changes.
9. Valves, fittings, etc., mounted outside for accessibility.
10. Compact, saves space—only 38 in. by 12 ft.
11. Net weight 16,000 lbs. approximately.

* Above specifications refer to 12-ounce machine.

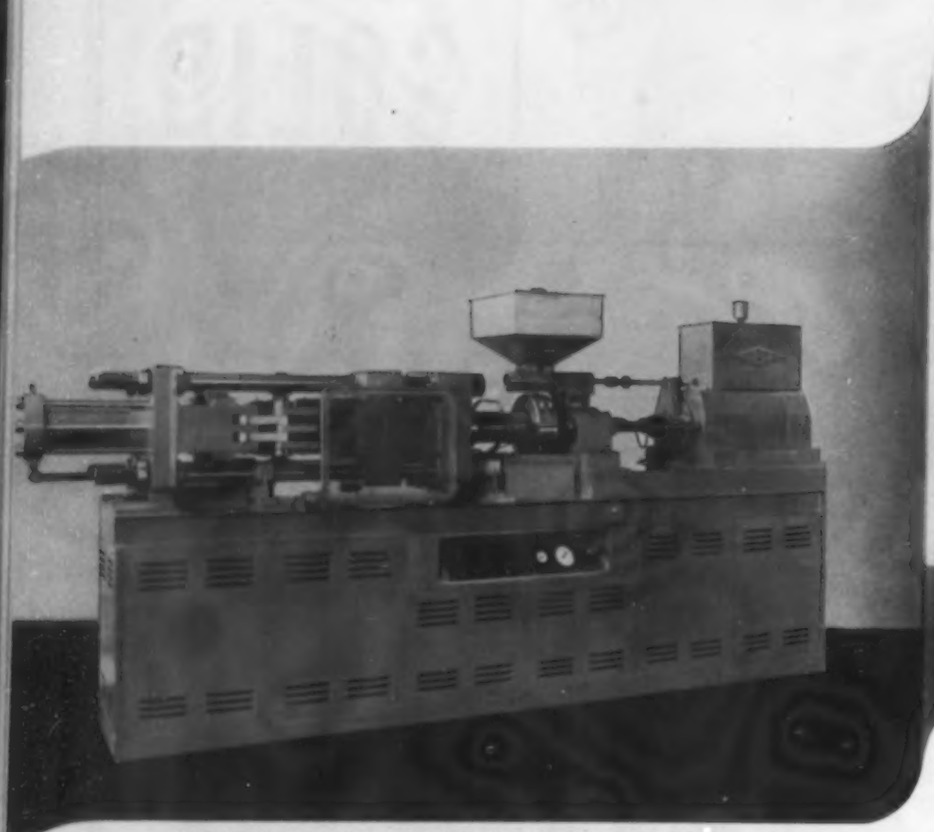
DE MATTIA *Machine and Tool Co.*

CLIFTON, NEW JERSEY

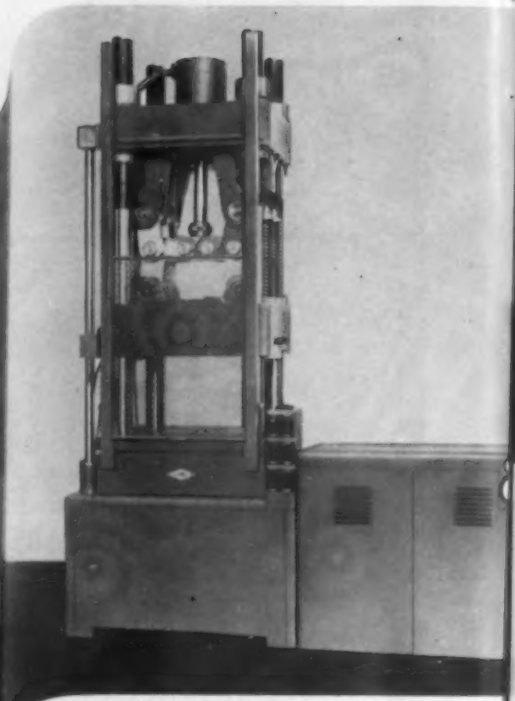
New York Office—50 Church Street
Cable Address: BROMACH, N. Y.

MOLD IT FASTER, BETTER, A

WITH AN IMPCO



IMPCO HF-4 MACHINE FOR INJECTION MOLDING



IMPCO TRANSFER MOLDING MACHINE

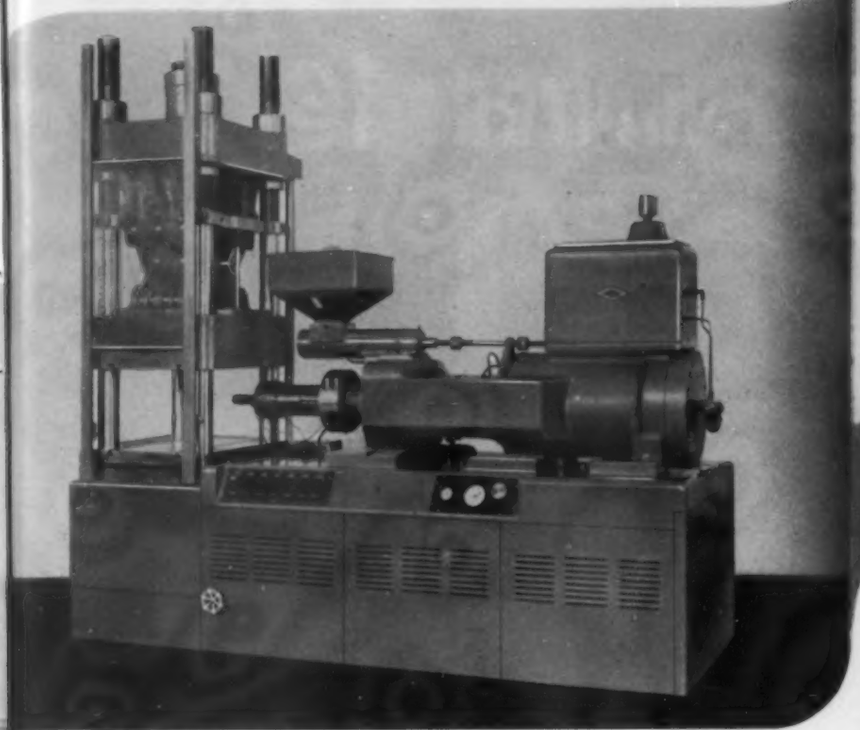
Improved Machines for

Write: PLASTIC MOLDING MACHINERY DIVISION

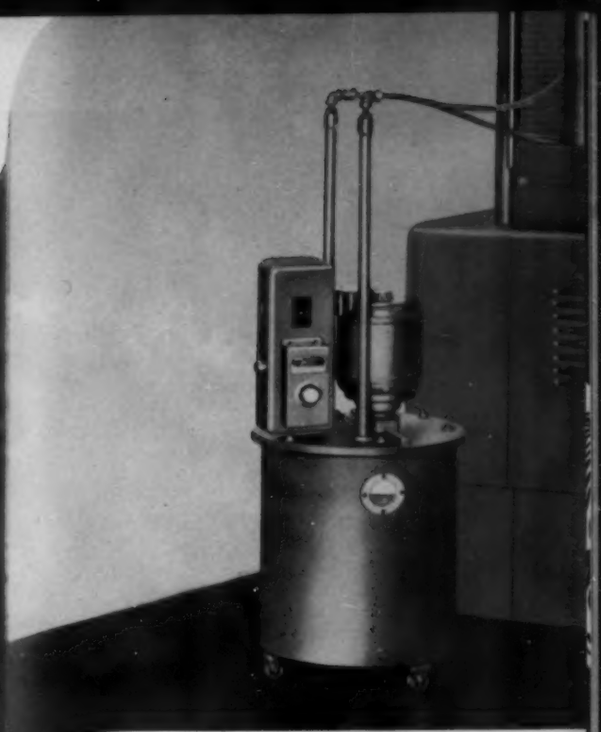
Improved Paper Machinery Corporation

NASHUA, NEW HAMPSHIRE

AT LESS COST



IMPCO VF MACHINE FOR INJECTION-COMPRESSION MOLDING



FLUID HEATING AND CIRCULATING UNIT CONTROLS MOLD TEMPERATURE

Injection Molding

The Impco HF is an efficient high speed machine for straight injection molding. Mechanical features include an improved hydraulic system and heating cylinder. All parts are accessible for easy adjustment. Capacities: 4, 8 and 12 ounces.

Transfer Molding

The Impco Transfer Molding Machine offers several features designed to increase output and reduce costs. Operated manually by push button control or automatic single cycle. Capacity: 350 tons.

Injection-Compression Molding

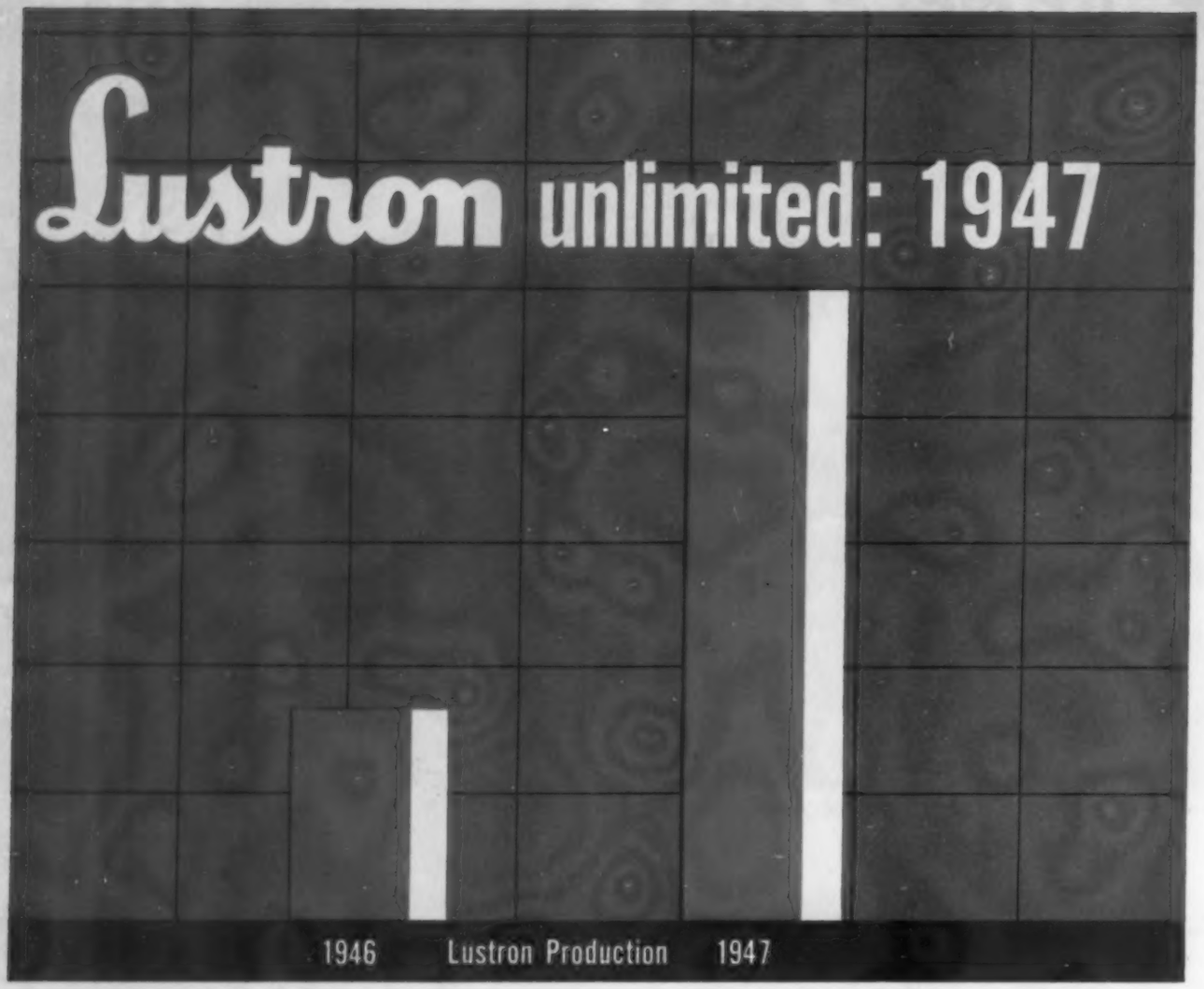
The VF type machine operates as a conventional injection, compression and transfer machine—or in combination. Capacities: 1½ to 22 ounces. This is an unusually versatile machine offering many opportunities to increase production, reduce costs, develop new markets.

Controlling Mold Temperatures

By maintaining the proper mold temperature this unit offers many advantages in both injection and injection-compression molding. Write for information.

MP-6

Lustron unlimited: 1947



Monsanto will manufacture approximately 80 million pounds of Lustron this year . . .

. . . nearly 300% *more* than last year . . .

. . . more than *all* the thermoplastics manufactured by *all* materials manufacturers in 1941!

Ready availability . . . in the face of continuing shortages in other materials . . . becomes one more compelling reason* for making your product plans with Lustron, Monsanto's polystyrene molding compound, the most versatile of all plastics.

All you who mold plastics, use them—or could use them—in manufacture, can now *go ahead* with your production plans with certainty . . . *with Lustron*. Write for complete Lustron data . . . technical information, information on supplies: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Mass. In Canada, Monsanto Ltd., Montreal, Toronto, Vancouver.

Lustron: Reg. U. S. Pat. Off.

***8 more reasons for specifying Lustron:**

- Rainbow range of colors, clear or opaque
- High dimensional stability
- Light weight
- Low price
- Excellent electrical properties
- Excellent resistance to moisture, acids, alkalies
- Finest moulding qualities
- Freedom from taste and odor

MONSANTO PLASTICS

SERVING INDUSTRY WHICH SERVES MANKIND

THE CASE *of the* PARKER "51"

held no mystery for us

—as is evident from the exquisite plastic bases produced by Creative for the new Parker "51" Magic Wand Desk Sets. Whether your need is something elaborate or just a knob or a bushing, send your specifications to Creative for an analysis.

Plastics Specification Quiz: If it's not convenient for you to send blueprints or samples, write for our "Plastics Specification Quiz". Two minutes with this Quiz will enable you to tell us which of your products may be improved by the use of plastics.

Creative

PLASTICS CORP.

963 KENT AVENUE • BROOKLYN 5, N.Y.

SOCIETY OF THE PLASTICS INDUSTRY

the rope fibre plastic

VERSATILE CO-RO-LITE

CO-RO-LITE facilitates production of another postwar consumer product, pre-formed at our factory, then molded into this modern baby stroller. The essential one-piece character of CO-RO-LITE adds great strength when compound curves are designed into the product.

CO-RO-LITE is equally effective with fluid pressure, flash or transfer molds. Long, tough interlocking rope fibres reinforce all sections of the molded unit, imparting great impact, flexural, compressive and tensile strength in a range of densities comparable to wood.

CO-RO-LITE—Rope fibres impregnated with thermo-responsive resin; Product and process patented, Patents No. 2,249,888 and No. 2,372,433. Other patents pending. Co-Ro-Lite Boat Patent No. 2,376,753.

ALLIED PRODUCTS DIVISION

Readily Preformed and Molded into COMPOUND CURVES · DEEP DRAWS ANGLES · CHANNELS · LARGE SHELLS

CO-RO-LITE GIVES YOU THESE 7 ADVANTAGES

- 1. Continuous reinforcement of long, interlocked fibres.
- 2. Greater impact strength.
- 3. Handy preforms for molding.
- 4. Readily adaptable to compound curvatures.
- 5. Wide range of molding densities.
- 6. Combined rigidity and flexibility in the same piece.
- 7. Usable in compression, fluid pressure, and transfer molds.

Long draws are easy with Co-Ro-Lite. This new dinghy is seaworthy, stout, easy-towing and strong enough to take an outboard.

The Co-Ro-Lite Pad shown combines in one piece a rigid, hub and a flexible rim, securely locked by the long, continuing fibres. Resin impregnation of the hub allows it to be polymerized to a rigid plastic.

This durable Co-Ro-Lite tray will stand plenty of rough treatment. Won't warp or get out of shape, and is easily cleaned.

COLUMBIAN ROPE COMPANY

460-92 Genesee St., Auburn, "The Cordage City," N. Y.

Canadian Licensee: Canadian Bridge Engineering Company, Ltd., Box 157, Walkerville, Ontario, Canada.

● Interlake *Resineering*—the functional engineering of a resin to meet specific production requirements—will help you produce a product of superior quality. Interlake's "custom-made" service gives you a resin that is always uniform and dependable. Furthermore, it sharply reduces production costs because the delays necessary to "adjust" each shipment of resins are eliminated.

INTERLAKE RESINEERING Consists of:

1. Thorough analysis of your resin problem followed by our recommendation.
2. Development of a resin for your particular application.
3. Testing this resin on the job, in *your* plant, working with *your* operating men.
4. Stabilizing its production for continuous uniformity in performance.

In addition, Interlake furnishes analytic inspection reports from its laboratory with each shipment, and offers general consultation service on resins. Without obligation, we will gladly discuss your resin needs with you—and tell you how Interlake *Resineering* has successfully served so many manufacturers. Write Interlake Chemical Corporation, Union Commerce Building, Cleveland 14, Ohio.

INTERLAKE CHEMICAL Corporation

• PRODUCTS FROM COAL •

New Sturtevant Dry-Batch Mixers

★ *Increase Output, Cut Costs*

★ *4-Way Mixing Action Assures Thorough Blends*

★ *Open-Door Accessibility Permits Fast, Easy Cleaning*

The new, improved Sturtevant dry-batch mixers thoroughly and efficiently mix two or more substances into a homogenous and inseparable whole, every part of which has the same analysis. The 4-way mixing action does a more rapid mixing job than other machines. The single receiving and discharging opening permits tight sealing during the mixing process. Open-door accessibility permits thorough cleaning.

The mixer is simple and easy to operate . . . hand lever controls both receiving and discharging. These efficient Sturtevant dry-batch mixers are available in five sizes with mixing capacities from 7½ tons to 75 tons per hour. Write for bulletin and complete information today.

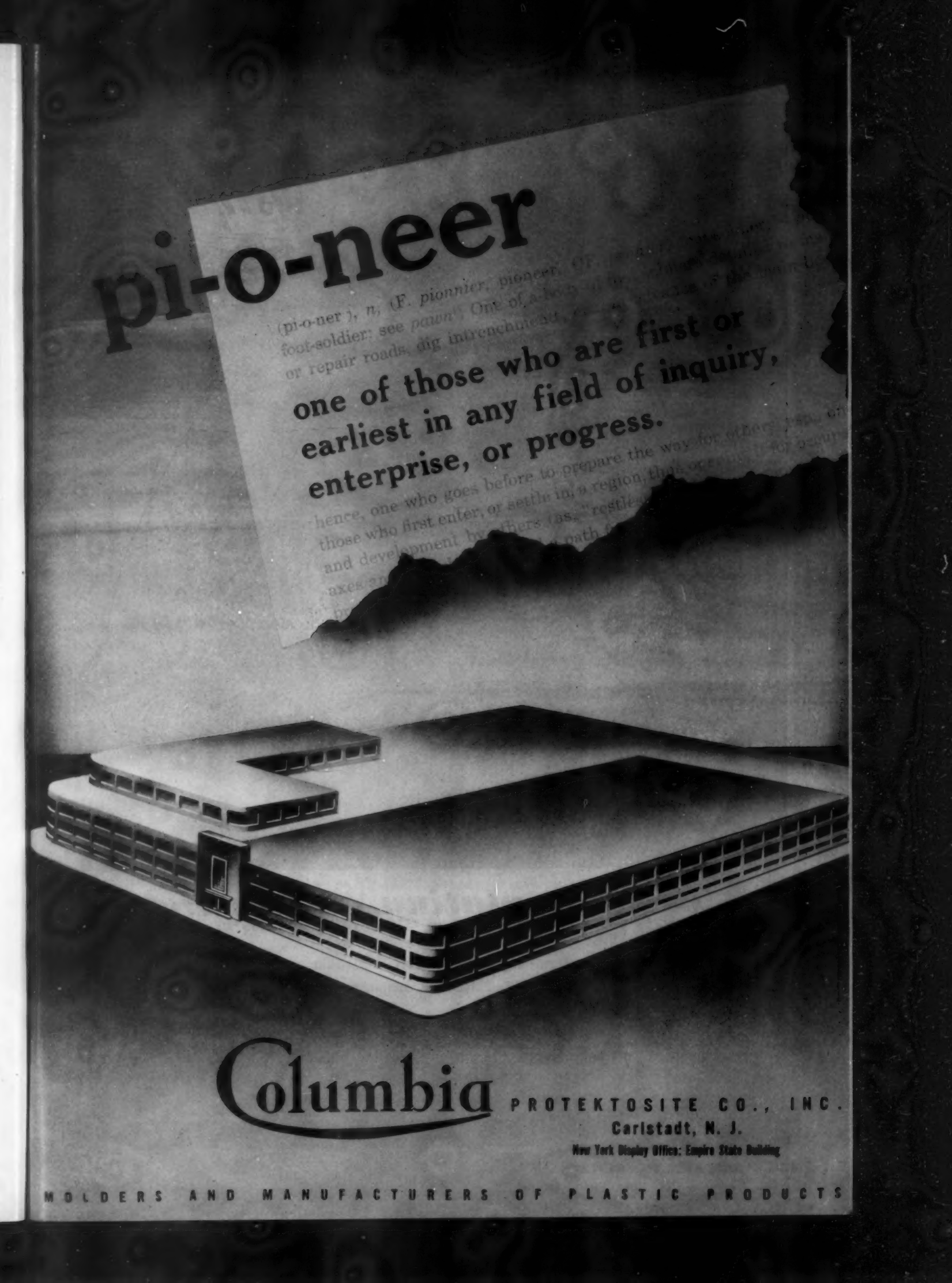
Receiving — The ingredients to be mixed enter the mixing chamber of the drum through a chute. Note scoops which carry up and dump the ingredients as the drum rotates.

Discharging — By simply throwing a lever, the inlet is closed and the mixer is in discharging position. The completely mixed materials drop off the lifting scoops and discharge through chute without segregation of ingredients.

STURTEVANT
MILL COMPANY
110 Clayton Street, Boston 22, Mass.

Designers & Manufacturers of

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS


pi-o-neer
one of those who are first or earliest in any field of inquiry, enterprise, or progress.
Columbia
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MOLDERS AND MANUFACTURERS OF PLASTIC PRODUCTS

for finer plating on plastics

SPECIFY PLASTIPLATE! Thru our exclusive plating processes, plastic buttons, jewelry, umbrella handles, bottle caps, chains, novelties, etc., are transformed into magnificent gold and silver products. The beauty, durability, and brilliance of our electroplated finishes cannot be excelled. For we have the necessary skill, experience and mass production equipment to make this possible at Low Cost.

Feel free to call on us, without obligation, for any of your plating problems. Precision platers to your specifications. . . **Plastiplate Co., Inc., South River, N.J.**

MASS PRODUCTION AT LOW COST

LEA METHOD COMPOSITION

PRODUCT ••• Styrene Buttons

OPERATION ••• "Breaking" Sharp Corners

SAVINGS ••• 30% in Production Time

The Quinn-Berry Corporation, Erie, Penna., manufacturers of quality plastic products, has this to say about the LEA Method and LEA Composition: "We originally finished the styrene buttons in two, or what actually may be described as three, operations: spinning, cut buffing to remove the rough surface caused by spinning, then finish, or, as we believe you describe it, 'color-buffing.' When we changed over to LEA Composition, the abrasive action was so fast that we eliminated the spinning completely and were able to maintain the same cutting and polishing speeds, thus saving approximately 30% in production time. Another grade of your composition was used for 'color-buffing'."

If the "breaking" of sharp corners or the removal of sprues, fins or residual flash are steps in your production line, why not consult LEA? The LEA Method may save you time, cut costs per piece and improve the quality of the finished product.

THE LEA MANUFACTURING CO.

Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods and Compositions

16 CHERRY AVENUE, WATERBURY 86, CONNECTICUT

What is 3-STEP SYNCHRONIZED *Processing?*

(F/B) MATCHED PRODUCTION UNITS COMBINED IN AN EFFICIENT TEAM

To give you an efficient, continuous flow of production in mixing, sheeting and calendering plastic stocks, Farrel-Birmingham has developed the three-machine, synchronized processing unit.

The three machines, a 3A Banbury mixer, 22" x 60" roll mill and 24" x 66" four-roll calender, are matched in production capacity. The size and design of the Banbury and the mill assure an even flow of properly conditioned material to the calender. The approximate 1200 pounds per hour capacity of the Banbury gives full time operation, without overload, to the mill. The calender is in ideal balance with its teammates for the majority of products, and is driven by an adjustable speed motor so that output speed may be adjusted according to the gauge of stock being run.

The long-proven efficiency of each unit in this synchronized combination assures uniformly mixed stock, processed under proper temperature control, free of any contamination and calendered to the exact gauge and surface required.

Where greater or lesser output is required, larger or smaller machines with matched capacities are available. One alternative giving approximately twice the amount of production consists of two 3A Banburys, two 22" x 60" mills and one 32" x 92" four-roll calender. Wind-up, let-off and cooling equipment can also be provided.

Farrel-Birmingham engineers will be glad to help you select individual machines or combination units best suited for your specific requirements.

Write for a copy of NEW Bulletin No. 183 which describes these synchronized processing units in detail.

FB-360

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONN.

Plants: Ansonia, Derby and Stonington, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, Stonington, New York, Pittsburgh, Akron, Chicago, Los Angeles, Tulsa, Houston, Charlotte

Farrel-Birmingham

HIGH STANDARDS FOR SMALL PLASTICS

The automatic machines that mold our precision closures also turn out millions of small thermo-setting plastics designed for hundreds of different uses.

Each one conforms to the rigidly high standards of strength and uniformity that have built our reputation as a *specialist* in the small plastic field.

Our volume production, based on years of manufacturing experience and research, assures high speed and low cost. If you need small plastic units in quantity, we are ideally suited to serve you.

LOOK FOR THIS TRADE MARK

PLASTICS DIVISION

OWENS-ILLINOIS GLASS COMPANY

TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES

NOW AVAILABLE *for your*

Platen Inlet and Outlet lines

TAYLOR 5-INCH INDUSTRIAL THERMOMETERS

Sturdy, compact construction with easy-to-read 5-inch scale.

HOW hot is your inlet steam while you're heating? How cold is your cooling water? How can you be sure of adequate circulation through the platens without knowing the temperature differential between inlet and outlet lines?

Taylor 5-Inch Industrial Thermometers will give you the answers quickly! . . . not only on these applications, but on many other jobs throughout the plant.

They're inexpensive, compact, sturdy and highly resistant to vibration. Patented Taylor "Binoc" tubing (pronounced Buy-Noc) has triple lens that makes mercury three times easier to read than ordinary tubing. New one-piece case is shallow for wide angle of vision. Tight-fitting glass front keeps out dirt and moisture. 5" scales are individually calibrated and thermometer tubing is "pre-aged" to assure permanent Taylor Accuracy. Available with wide variety of temperature ranges in straight and angle forms.

Best of all, we usually can promise immediate delivery from stock! Send for catalog or call in your Taylor Field Engineer today. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada. *Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.*

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

it's another . . .

ERIE RESISTOR
CUSTOM MOLDED JOB

THIS *Big* POLYSTYRENE REFRIGERATOR DRIP TRAY

- NO BUBBLES
- NO FROSTING
- NO FLOW LINES
- NO WARPING

THIS 14" crystal clear Polystyrene refrigerator drip tray, as custom molded for General Electric Company, is a beauty. Thousands of American women will buy it, use it, and admire it, without giving a thought to the difficulties of making it.

It was all in the day's work at Erie Resistor to give the mold platens the extra bracing necessitated by the unusual area and consequent tremendous die back-pressure; to incorporate supporting ribbing in the mold to prevent warping; to accomplish meticulously accurate control of heat, cycle, and pressure, to prevent bubbles, flow marks, and frosting.

All in the day's work—but, when you have a difficult molding problem, it's a satisfaction to feel that you have placed it in hands that are not thrown up in dismay, but accept the difficult as a challenge, and produce parts that meet the customer's entire requirements.

Plastics Division

ERIE RESISTOR CORP., ERIE, PA.

LONDON, ENGLAND · · TORONTO, CANADA

TRAINING

in step with

INDUSTRIAL TRENDS

Plastics Institute training is predicated upon two basic principles:

A. Thorough study of accepted practices and materials.

B. Evaluation of current problems, new materials and new techniques.

For example, here are

THREE TYPICAL CASTING ASSIGNMENTS

Casting of Phenolic Resins Industrial and decorative applications of cast plastics are prominently featured in student projects. Each student is given opportunity to prepare his own molds and castings.

Slush Casting of Thermoplastic Granules Various techniques of slush casting thermoplastic granules are taught. Attractive, light colored hollow-walled objects can be prepared in a relatively short time.

Imbedding of Specimens in Transparent Plastics The imbedding of articles in transparent plastics has captured the interest of many students. Preservation of botanical specimens offers a field of activity which benefits from this unusual casting procedure.

In addition to casting, other phases of plastics thoroughly covered at Plastics Institute include: Mold design, high-frequency pre-heating, fabrication and lamination. Testing methods and molding practices are taught on equipment of the type used in the industry.

Your inquiries regarding both the Home Study Training and Resident Technology courses are welcomed.

Resident School and Home Study Courses APPROVED FOR VETERANS

Plastics
INDUSTRIES TECHNICAL
INSTITUTE

Francis A. Gudger, President John Delmonte, Technical Director

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VETERANS as well as CIVILIANS now training with Plastics Institute, upon graduation, are qualified and worthy of your consideration for employment in the various branches of the plastics industry. Write to the nearest branch of Plastics Institute stating your requirements. We will endeavor to select a graduate best qualified to meet your needs.

delivery?

AT MIDLAND IT'S FASTER THAN A CAT CAN HAVE KITTENS!

This wall socket hobbed cavity by Midland incorporates two narrow "T" projections raised 3/16 inches above the cavity surface. By using hobbed cavities of this type in place of the conventional insert cavities, all unsightly parting lines were eliminated and in addition to improving appearance, the hobbing was accomplished at only a fraction of the cost of cavity duplication by machining methods.

Yes, actually! It takes a cat nine weeks—and on most hobbed cavity jobs we do a *lot* better than that! Our skilled craftsmen, our machining, engraving and hobbing equipment are working constantly, accurately on a schedule that means delivery of hobbed cavities in a matter of weeks —not months. Whenever you order from Midland you are assured the kind of accurate, uniform, perfectly finished hobbed cavities that only skill and experience can provide.

So if limited molding capacity and long quoted delivery are holding you back, grab the problem by its neck and bring it to Midland where delivery is shaved to a cat's whisker.

For a clear picture of our equipment and our know-how, write for a copy of "Shaping Tomorrow Today." Better still, send your blueprints!

MIDLAND DIE AND ENGRAVING COMPANY
1800 W. BERENICE AVENUE • • • CHICAGO 13, ILLINOIS
Makers of Plastic Molds · Die Cast Molds · Engraved Dies · Steel Stamps · Hobbings · Pantagraph Engraving

Formaldehyde-Heyden

Synthetic resins made with FORMALDEHYDE-HEYDEN serves the plastics manufacturer, whether he is using Casting resins, Laminating resins or resins suitable for injection or compression molding.

Because it is consistently low in acidity, iron and copper content, and high in uniformity, FORMALDEHYDE-HEYDEN makes the finest Phenolic, Melamine and Urea Resins.

FORMALDEHYDE-HEYDEN serves also in the production of casein plastic, used largely in buttons, buckles and costume jewelry.

FORMALDEHYDE-HEYDEN is available in amounts to meet any requirement: Tank Cars and Trucks, Carboys and Drums, as well as in Bottles for small quantity users.

Further information, also Technical Data Sheets will be sent upon request.

HEYDEN

Chemical *Corporation*

393 SEVENTH AVE. NEW YORK 1, N. Y.

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Benzaldehyde · Benzoates · Benzoic Acid · Benzyl Chloride Bromides · Formates · Chlorinated Aromatics · Medicinal Creosotes · Formaldehyde · Formic Acid · Glycerophosphates · Medicinal Guaiacols · Hexamethylenetetramine Penicillin · M.D.A. · Paraformaldehyde · Parahydroxybenzoates · Pentaerythritols · Salicylates

THE entire mechanism—hydraulic pump, motor, valving, oil level gage, filter, and reservoir—all completely enclosed for maximum safety. All moving parts isolated from possible contact with clothing or hands and protected against damage.

3 G.P.M. to 12 G.P.M., 1200 P.S.I.
1-¼ G.P.M. to 5 G.P.M., 3000 P.S.I.
3 G.P.M., 5000 P.S.I.

½ G.P.M. to 1-¾ G.P.M., 10,000 P.S.I.
Combination high and low pressure units to 12 G.P.M., 6000 P.S.I.

These compact hydraulic units operate laboratory and production presses, roll balancing devices, hydrostatic testing equipment, hydraulic controls, machine tools, arbor presses, etc. Complete engineering information for any particular application available.

B. F. PERKINS & SON, Inc.
Hydraulic Division
HOLYOKE, MASSACHUSETTS
Manufacturers of Industrial Machinery Since 1873

WHY IS RIGHT-ANGLE LOADING BETTER?

It assures longer bearing life . . .

Permits heavier radial and thrust loads . . .

Reduces load on each individual roller . . .

Cuts down service attention . . .

ROLLWAY Right-Angle-Loaded BEARINGS have *every one* of these advantages because they reduce every load to its component parts—*pure radial and pure thrust* . . . and carry *each* of these loads on a *separate* bearing assembly—AT A RIGHT ANGLE TO THE ROLLER.

Because of this, Rollway Bearings can use solid cylindrical rollers of greater mass and cross-section area in a given space. Result: *increased load capacity . . . reduced maintenance attention . . . longer wear, with no pinching or wedging, less friction on roller ends.*

Send us your plans today for engineering analysis and bearing recommendations.

ROLLWAY BEARING CO., INC.
Syracuse, N. Y.

SALES OFFICES:
Philadelphia Boston Pittsburgh Youngstown Cleveland
Detroit Chicago St. Paul Houston Los Angeles

Rollway CYLINDRICAL ROLLER BEARINGS

It's not Chicken Feed!

There is no profit in feeding plastic pellets to poultry. Plastics are neither literally nor actually chicken feed. Each pellet that contributes to the whole of a salable product is a vital factor affecting its success.

The sound policy is to place your plastics problem in the hands of competent, experienced craftsmen teamed to modern molding facilities.

Plastic Die & Tool Corp. offers you these facilities—engineering, die-making and molding—all in one. Here your plastics problem is solved at its inception—engineered to outdistance competition; planned for low cost production which insures a profit to you.

Write or wire for catalog showing our facilities for solving your plastic injection molding problems.

D&T

PLASTIC DIE & TOOL CORP.

2140 S. Vermont Ave. Los Angeles 7, California

Plasti-Bark SIGNS

Durabrite* CALIFORNIA

First things first...

Putting the horse before the cart is essential in any business where orderliness and efficiency are vital. Problems in plastics are best solved by a company such as ours... for it's here that your requirements receive efficient handling and follow-through.

WE BUY, SELL AND RE-WORK PLASTICS SCRAP

Plastics Divisions

H. MUEHLSTEIN & CO. INC.

122 EAST 42nd STREET, NEW YORK 17, N. Y.

BRANCH OFFICES: New York • Akron • Chicago • Boston • Los Angeles • Memphis

WAREHOUSES: Jersey City • Akron • Boston • Los Angeles • Memphis

2 ounces

HY-MAC

PLASTIC INJECTION MOLDING MACHINE

MODEL IM-2

a Warren Groves design

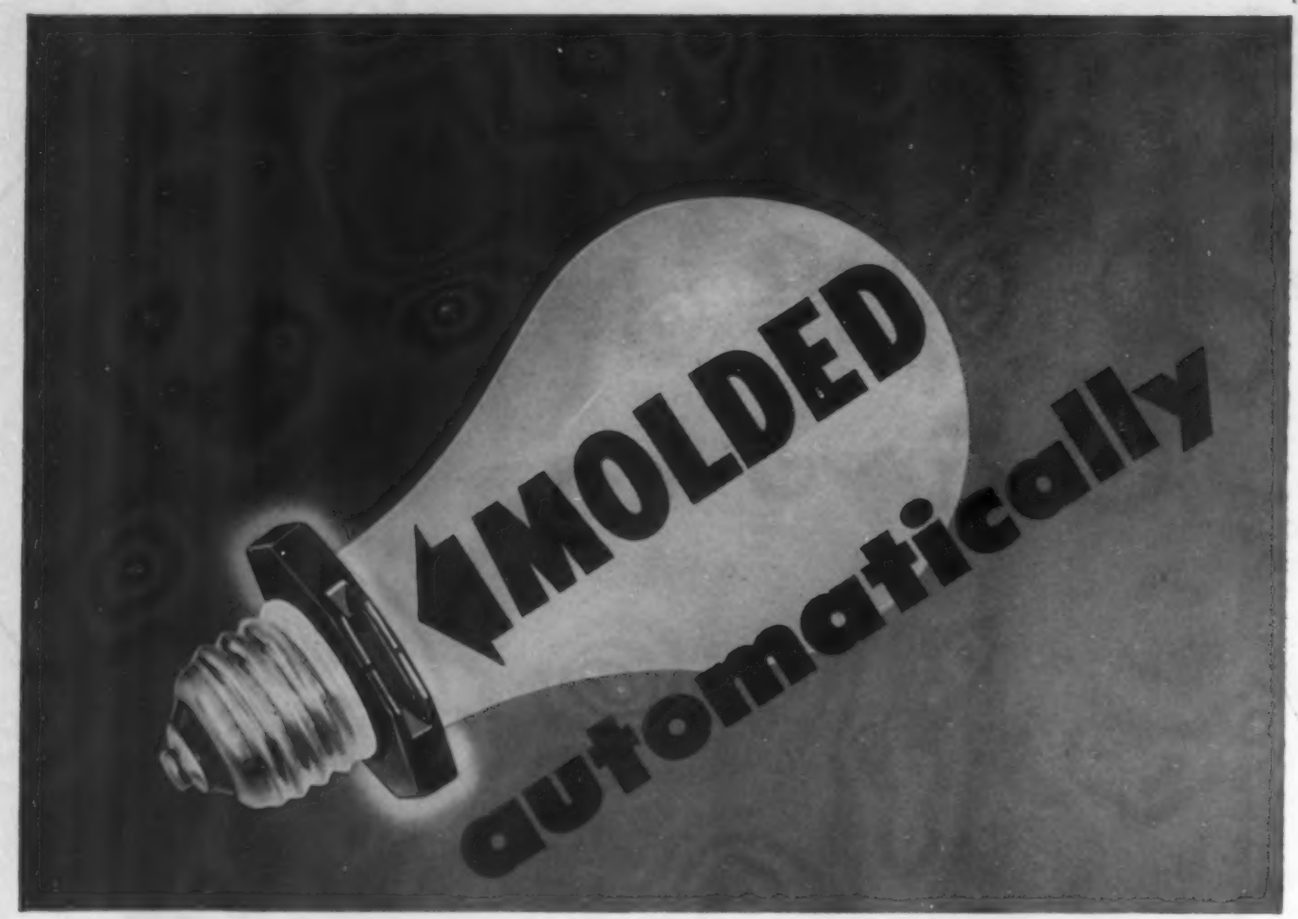
Ideal for Mass Production of Small Plastics Hardware, Toys, Novelties, Jewelry, Etc.

The newly announced Hy-Mac 2-ounce Injection Molding Machine embodies advanced features of controllability, ease of operation, and production efficiency, which make it ideal for multiple production of small units by inexperienced operators. New type electronic control provides accurate temperature regulation; eliminates danger of burning material. Although rated at 2 ounces, the machine is built with 50% overload capacity. Now in production; order at once for prompt delivery.

See this machine in operation at our plant, or send for complete description.

HYDRAULIC MACHINERY, Inc.
12825 FORD ROAD
Dearborn, Michigan

HYDRAULIC MACHINERY • WESTERN DIVISION • GLENDALE CALIFORNIA



AT SUBSTANTIAL SAVINGS OVER CONVENTIONAL METHODS

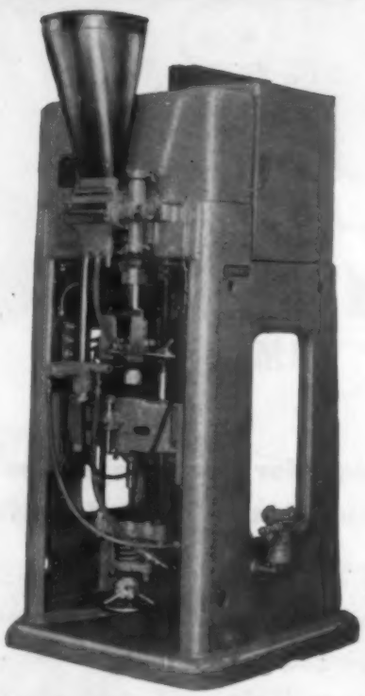
When this three-way switch was put into production, both conventional molding methods and Completely Automatic Molding were investigated.

Analysis of all cost figures led to the selection of Completely Automatic Molding on many counts—lower mold cost, more quickly into production, minimum labor and finishing costs.

With Stokes Completely Automatic Presses, cycles are reduced through split-second timing. Flash losses are reduced 8% to 10% and more. Mold costs are low because few cavities do the work of many. Production design changes can be made quickly and economically. Molded parts are uniform, of highest quality, always accurate.

Investigate Completely Automatic Molding.

F. J. STOKES MACHINE COMPANY • 5934 Tabor Road, Philadelphia 20, Pa.



F.J.Stokes MOLDING EQUIPMENT FJS Est. 1895

IN THE METALWORKING INDUSTRIES

THE MAGAZINE EDITED FOR THE MEN WHO DECIDE:

Which Material?

(WHOSE MATERIAL)

Magnesium
or
Metal-Wood
Composites!

What Method?

(WHOSE EQUIPMENT)

Drilling
or
Punching!

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METALS ALLOYS

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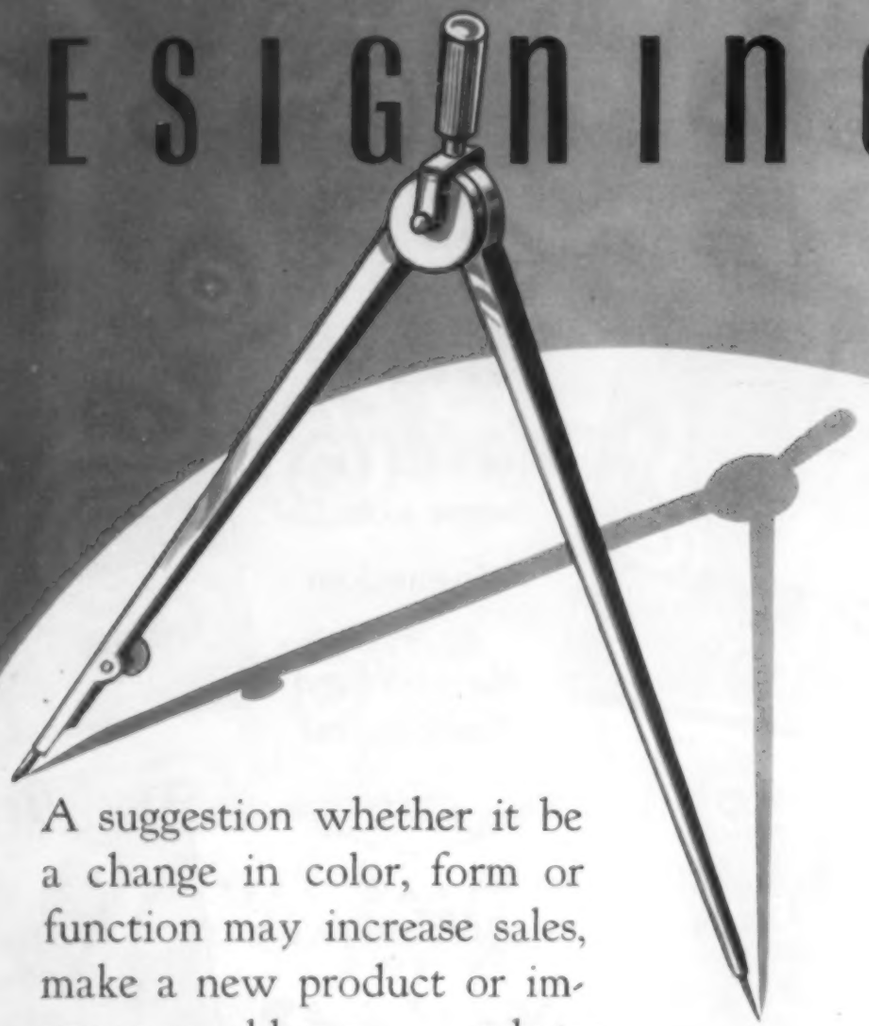

A suggestion whether it be a change in color, form or function may increase sales, make a new product or improve an old one . . . whatever your problem, our design department is at your service.

INJECTION MOLDING
MINCOR
"YOUR PLASTICS DEPARTMENT"

MINNESOTA PLASTICS CORP.

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The Swing is to NIXON

Louisville Grand Slam clubs are made by Hillerich & Bradsby Company, Inc. Louisville, Kentucky.

Nixon

C/N CELLULOSE NITRATE

C/A CELLULOSE ACETATE

E/C ETHYL CELLULOSE

Plastics

A golfer whose bag contains a set of Louisville Grand Slam wood and iron clubs is one or two up on the rest of the foursome. The shafts on Louisville iron clubs and the sleeves on their wood clubs are covered with Nixon C/N (Cellulose Nitrate) thin wall tubing. The adapters for their iron clubs are turned from Nixon C/N heavy wall tubing. Few items of sport equipment take such a beating as a golf club. Any material used in its making has to be tough. That is one of the reasons why the swing is to Nixon C/N plastic sheathing. Nixon C/N is also available in sheets, rods, and extruded shapes.

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This booklet belongs on the desk of every designer, engineer, production chief and purchasing agent in plastics. Send for it.

PLASTICS THAT **GLOW** IN THE DARK . . . MEAN SALES THAT GROW IN THE DAY!

VIOLITE*

LUMINESCENT PHOSPHORESCENT FLUORESCENT PIGMENTS

Plastic products that *glow in the dark* have tremendous sales appeal. This has been proved time and again with dials, knobs, signs, markers, wall-plates, tools, radios, toys, novelties, etc. There may be many items you are now manufacturing, or planning to manufacture, that will benefit by this simple improvement. And it *is* simple! Merely specify the addition of VIOLITE Phosphorescent or Fluorescent Pigments when ordering your plastic molding powders. If you are not completely familiar with the many possibilities offered by VIOLITE send for this free booklet today.

WHEN ORDERING MOLDING POWDER

SPECIFY *VIOLITE* . . .

You need no extra equipment . . . your unit production cost is not appreciably increased . . . you need not alter your production methods . . . our technical experts will gladly advise you how VIOLITE can be used in your own products.

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Reg. U. S. Pat. Off.

SCORES

in hockey aren't made with baseball bats!

The business of making "home-runs" calls for much different equipment than that with which "goals" are scored.

Even though baseball bats and hockey sticks are both made of wood, they are "engineered" for different objectives. The various physical and chemical characteristics that make MOSINEE papers win in a wide range of highly specialized industrial uses, are also definitely engineered into these essential papers. MOSINEE paper technicians are equipped with scientific laboratory and production controls, plus practical "know how" based on broad experience in creating papers of many characteristics, such as extreme stretch without loss of tensile strength, high absorbency, moisture repellency, controlled pH for desired alkalinity, acidity, or neutral reaction, etc.

* * *

In many industries MOSINEE paper technicians are helping manufacturers and converters to improve products and production. Call MOSINEE.

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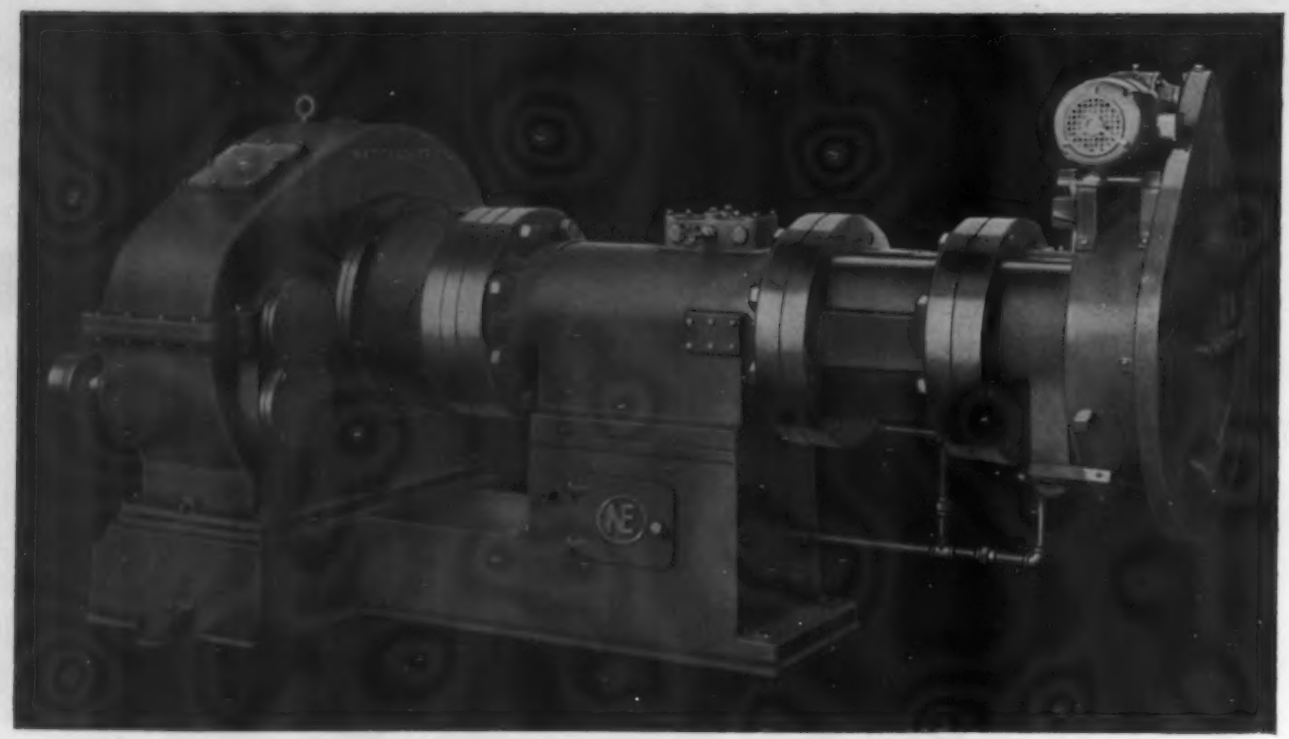
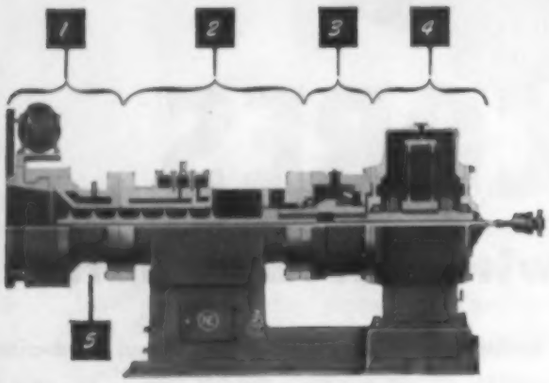
Essential Paper Makers

Please address your letter "Attention Dept. A"



NATIONAL-ERIE *features* Sturdy Unit Construction



UNIT CONSTRUCTION
1–HEAD UNIT
2–CYLINDER UNIT
3–THRUST UNIT
4–GEAR REDUCTION UNIT
5–STOCK SCREW

Shown above is an 8½" NE Extruder. It has a wide application in processing natural and reclaimed rubber, plastic materials and extruding finished plastic shapes. Like all NE Tubers, it features heavy unit construction for long trouble-free service and ready accessibility for inspection.

No two applications are alike. Materials and processing speeds vary. NE engineers work closely with your engineers to get the best combination of unit assemblies. Great advance has been made in electric heating element design which considerably improves performance.

We have supplied almost every leading processor of basic plastic and rubber materials and have a wealth of general experience to help you in working out your special application. Write us today about your extrusion problems.

• *Write for copy of our general catalog that fully describes this 5-unit construction.*

NATIONAL ERIE CORPORATION
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blooming
for PLASTICS!
There's a ready market for items created of Mirror Plastics' lustrous, pliable, colorful films and sheetings. The variety of profit-making merchandise you can produce is limited only by your own imagination. The public has accepted the integrity of good plastics. So, you reflect wise judgment when you choose Mirror Plastics that have undergone proper compounding and fabricating — you assure both your own and your customer's satisfaction. Inquire today!
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ATTRACTIVE COLORS
FOR YOUR PRODUCTS
MIRROR PLASTICS
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Why hard rubber for fountain pen parts?

The solution to a design or production problem of your own may be found in this list of reasons why so many fountain pen manufacturers use hard rubber:

1. An exacting capillary action in the feed rod to insure an ever-ready smooth flow of ink.
2. Immunity to the corrosive action of ink.
3. Stability when in contact with oil, water, heat, cold, or changing temperatures.
4. Good machining qualities.
5. Resistance against chipping, splitting and cracking under normal usage or when dropped.
6. Stability under pressure (for pens fly today with air passengers).
7. Price—hard rubber is cheaper than other plastics currently being considered for this application.
8. Ample supply.

In addition, hard rubber finishes to a soft, lustrous ebony with a smooth contour. No mitre lines appear on the pen. It has a pleasant, sure feel in the hand of the user. It is a hard compound with a certain degree of resiliency which makes it a fine material for cutting, facing, grinding, reaming, or tapping.

We manufacture rods and tubing in rough, ground, or polished form to the tolerances specified by fountain pen manufacturers. Our chemical and engineering staff has developed specific rubber compounds for these applications. However, since we have research and manufacturing facilities for both rubber and plastics, our laboratories test new developments in both so we can suggest better materials as they appear.

Do you need a lot of something like fountain pen parts?

If you are planning or using large quantities of a product that approximates these parts in size, shape, physical and chemical requirements . . . or something which may gain added appeal from that certain satisfying "heft" and "feel" of hard rubber . . . chances are that our experience and facilities for efficient large volume production will enable us to fill your needs at reasonable cost.

VULCANIZED RUBBER AND PLASTICS COMPANY

formerly . . . The Vulcanized Rubber Company

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General Offices: 4 East 29th Street, New York 16, New York Works: Morrisville, Pa.

Platé Trio-Ette, molded for House of Platé, Detroit

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Artful molding can empower your feminine products with an irresistible selling point... the magic touch of sheer loveliness. Grace of line... charm of design ... exquisite detailing are qualities which dictate our planning and molding of all products with feminine or fashion appeal. We select plastic materials, use molding techniques that will most effectively combine the beautiful and the functional. Colors and styling to recapture an endless variety of moods and fancies play a leading role in our production planning. This Platé Trio-Ette, for all its loveliness, reflects but one facet of our ability to express beauty in plastics molding. If your products lend themselves to injection molding or extrusion we will show you a glorious new blending of the beautiful and the practical... surely an invaluable sales asset for you. Your inquiries are invited today.

Write on your letterhead for the new injection Molded and Extruded Plastics catalogue. Or, for detailed information about CHEMI-PLASTIC* pipe, tubing and fittings, write for circulars containing data and illustrations.

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Saran BY NATIONAL

MONOFILAMENTS THAT CREATE WEAR-RESISTANT WELT

IT'S in the tough spots that SARAN monofilaments display their rugged durability. SARAN welt both reinforces and beautifies upholstery in modern furniture, automobile seat covers and transportation seating. In this particular application, a product of Bridgeport Fabrics, Inc., a core of heavy SARAN monofilament has been wrapped with a braiding of finer strands of SARAN to form a secure reinforcement for points of greatest strain and wear. The wide color range of SARAN monofilaments permits perfect blending with every type of fabric.

SARAN is easy on clothes, too. Its natural smoothness permits you to slide comfortably into your chair without the tug and pull usually encountered in other fabrics.

CONSULT NATIONAL

Each application of SARAN monofilaments has been instrumental in suggesting still other uses to manufacturers and product designers. We, at National, manufacture no finished products; but our research and experimental laboratories, staffed by skilled technicians, are available for study and advice on the application of SARAN to your product.

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The NATIONAL Plastic Products Company

ODENTON • MARYLAND

When you're planning for profitable production, here are three big things that Baldwin has to offer:

1. Engineering Services to cooperate with you in putting the right press on the right job.
2. A Standard Line of Hydraulic Presses offering custom-built features which help to speed output, guard quality and reduce rejects.
3. Design Service, implemented with experience gained in developing every variety of hydraulic press, when you need an entirely new press to take care of new or unusual production needs.

May we consult with you?

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The Baldwin Locomotive Works, Philadelphia 42, Pa., U. S. A. Offices: Philadelphia, New York, Chicago, St. Louis, Washington, Boston, San Francisco, Cleveland, Detroit, Pittsburgh, Houston, Birmingham, Norfolk, Seattle.

BLW THE BALDWIN GROUP

BALDWIN

HYDRAULIC PRESSES

"Could I Interest You, Sir, in Our Super Loud Plastic Whistle?"

FREE!

We've got something you might like to have—a special Decimal Chart, 3-ring punched to fit your notebook. This chart gives diameter, area, and circumference of circles, and surface and volume of spheres for each additional fractional increment (1/64) of diameter. Write us on your company letterhead for your copy.

Here's a new one for the books—which we *don't* heartily recommend! We do advise, though, trying Boonton next time you need plastic molded parts. We'd like to interest you in a plant that's—

- staffed with a lot of the old-timers in the field of molded plastics.
- supplemented by a lot of good men, carefully chosen and trained by the old-timers.
- been molding good plastic parts for 25 years.
- successfully molded the best raw plastic materials available . . . all kinds into all shapes.
- filled with the most modern plastic molding equipment available —some of it we've even designed ourselves.

If you are a prospective customer for our molded plastics and would like to check these points, we'll be glad to arrange for you to see our movie entitled "The Shape of Things to Come", or take a trip through our plant. Just phone our New York Office—MUrray Hill 6-8540.

If it can be Molded, Boonton can Mold it—We Hope

BMCO

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CUSTOM ENGINEERS
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SIMPLIFIED *Process Heating*

GIVES HIGH TEMPERATURE (700°) AT LOW PRESSURE (88 lbs.)

Evaluate in terms of your present processing method what uniform temperature, high rate of heat transfer, and close control of temperature mean. Add to this the factors of simplified design, permitting you to heat and cool in the same cycle; safety and simplicity in operation; and low maintenance of equipment.

A Foster Wheeler Dowtherm heating system will give you all these advantages, and in addition improve the quality of your product.

If you are looking for greater operating economy, find out what this modern high-temperature low-pressure method can do for you. Address

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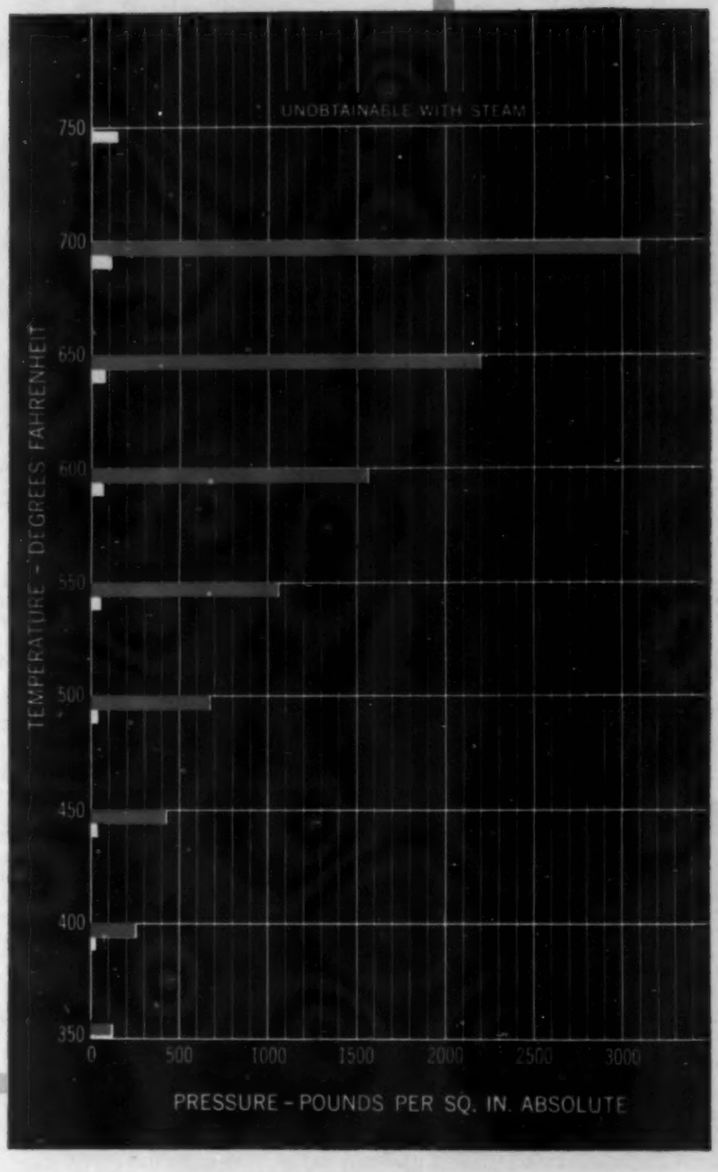

TEMPERATURE-PRESSURE COMPARISON
Dowtherm ▭ Steam ▬

This chart gives a direct comparison between pressures in FW Dowtherm heating systems and those encountered in steam systems for the same working temperatures.

FOSTER WHEELER

AUBURN Plastics Reporter

Auburn Button Works, Auburn, N. Y.

MOLD MARK

Profitable Tips to Designers

Thermoplastic parts, if designed with one eye on moldability, can be trouble-free to an extent that makes them cost much less than if the molding problems are not considered. The importance of uniform section thickness, with thickness held to a minimum, cannot be overstressed. Remember that material injected into a closed mold follows the lines of least resistance, filling the heavy sections first. Watching out for 'welds' and sink marks is our business. It's also part of Auburn's procedure to propose changes in your part drawing, provided, of course, that we can save you time and money. We would be glad to have you consult us first, without obligation of course.

Another point—your print or accompanying letter should indicate just how much importance is attached to complete elimination of the 'gate' scar—the degree of perfection required will substantially affect the size of our cost estimates to you.

Says "Hello"

David M. Osborne of the Sales Department, who has had many a good cry with long-distance customers over conditions during the past year. His crossed fingers are not shown. Mr. Osborne recently underwent a serious operation.

Auburn Plant Number Two Houses Injection and Rotary Molding Machines

Plant No. 2—acquired in 1945 adds 60,000 sq. ft., is laid out for mass production.

Two miles from the main plant, which sprawls over 22 acres at the western outskirts of Auburn, the new plant is near the business district, a block North of Route 20. The plant was completely built over to include in its straight-line layout the latest thinking in terms of mass production efficiency.

Unusual Conditioning Room

In the basement next to material storage is an insulated room where molding compounds are dried out by exposure to hot, dry air for a 2-day period just before molding. In addition to eliminating "summer complaint" (perversity of molding materials on humid days), this regular procedure has resulted in superior quality in the molded piece at minimum cycles. Material remains on pallets from arrival to delivery at press.

Flexible Finishing Room

Liberal use of buss duct, fluorescent light trolleys, compressed air outlets and exhaust ducts makes possible the use of straight-line finishing setups. Drill presses, benches, broaches, buffs, etc., are quickly installed in proper operational sequence, removed on completion of that particular job, reducing handling and finishing bottlenecks. This operational flexibility helps lower our costs and thus permits us to maintain top quality at minimum price to you.

Molding Room is Janitor's Pride

A large, light room houses the battery of Lauterbach machines. These incredible producers, laid out with plenty of room for high frequency heaters when required, are automatic rotary compression molding presses. All high pressure pipes, electrical conduits and compressed air lines come up through the floor—a specially finished hardwood floor, easy to keep clean. Once a week the walls and fixtures are vacuum-cleaned to eliminate possible dust contamination in molding light colors.

Special Assembly Department

On the second floor is a conveyor installation for the assembly of plastic molded components. There are two wide belts, the longest being 175 feet, intensely illuminated. Operators produce under a group incentive system.

Some Expanding Departments Move from Plant No. 1

Not shown in the photograph is the Injection Molding Department, whose big presses are in a one-story wing at the back of the building, next to the elevator and the Receiving Department. Three 22-ounce machines have recently been added to the department. Sales, Purchasing and Accounting Departments are now located at Plant No. 2, the office wing showing at right.

Auburn Makes Another Scoop!

DIPPEX Coffee Measure, Designed by Egmont Arens. Comes with your SILEX.

WHEREVER PLASTICS ARE PREHEATED...

AIRTRONICS*

means

Engineering Leadership!

From AIRTRONICS' laboratories has come a steady stream of advancements in preheater design inspired by *and fulfilling* the practical requirements and preferences of the molding industry. Dual Load Selection, Automatic Power Regulation, Automatic Load Accommodation, Automatic Excitation Regulation, powerful Vacuum Cooling—all these features plus extreme compactness and mobility, simplicity of adjustment and operation, versatility of application and *reliability* of service make AIRTRONICS Dual Preheaters the choice of discriminating molders from coast to coast. Contact the nearest AIRTRONICS representative for complete details.

2.5 KW
Model DH

Airtronics MANUFACTURING CO.

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HOW CAN MOLDED PLASTICS SERVE YOUR NEEDS MOST EFFICIENTLY?

PMI

RESEARCH AND DEVELOPMENT

Thru research, important information and facts are obtainable which guide product development.

PMI is prepared to do both the Research and Development to help solve your problem of design or performance, and to produce the molded plastic that serves your product needs most efficiently and dependably.

Thru sound plastics engineering, and by working closely with manufacturers and their engineers, we have developed designs to meet difficult performance requirements. Frequently we are able to solve product problems by the use of original techniques in plastic molding. This too is a part of PMI Research and Development.

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For more information on how you benefit from PMI plastics services, write for latest Catalog Folder M.P. 2

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Dependable
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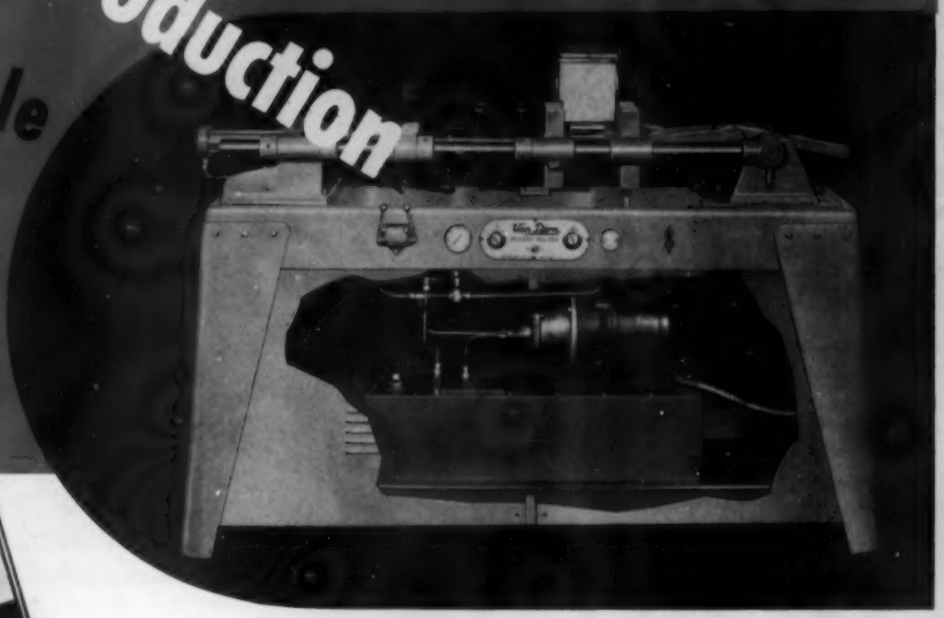

Write **FOR FREE FOLDER**
which illustrates and describes the Van Dorn Plastics Injection Press and its applications.

This Van Dorn 1 oz. molder, powered by a 2 hp motor, is hydraulically operated for economical production. ● Automatic temperature control, automatic parts ejection, simple operation and low cost are a few of the advantages of the H-200 Press.

WE MAKE MOLDS for Van Dorn Presses... Proved—Tested—Ready to Run

THE VAN DORN IRON WORKS CO.
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A New Cast Resin, Thermosetting Plastic with Distinctly Superior Characteristics.

No matter what plastic product you use or plan, be sure to look into this new plastic, "Tecklin."

"Tecklin" is particularly beautiful—unusually nice to feel. It's tough and strong—odorless and nontoxic. "Tecklin" comes in an unlimited array of striking colors, both opaque and translucent. And whatever color you choose you get—for keeps. Because "Tecklin's" shades stand up and successfully resist fading.

This is why "Tecklin" is tops for cutlery handles, drawer pulls, toilet goods, beads, clock cases, light fixtures or what-have-you.

"Tecklin" has been introduced, and is exclusive with the Teckna Company. So, if you wish, skilled designers, headed by William Longyear, will help you with your plans. Master toolmakers will fashion molds. And manufacturing will be under streamlined, cost-cutting methods.

In this way your "Tecklin" product will reach you trim and perfect — guaranteed by its complete production under a single responsibility.

Easy to see, isn't it, why you should get all the facts about "Tecklin"? We'll be glad to see that you get them.

TECKNA COMPANY INC.

Plastic Fabricators

NORTHERN B'LVD & 223rd ST., BAYSIDE - NEW YORK

TELEPHONE BAYSIDE 9-5302

TECKNA

Blaw-Knox 750 Gal. Electro-Vapor Resin Kettle on car ready for shipment.

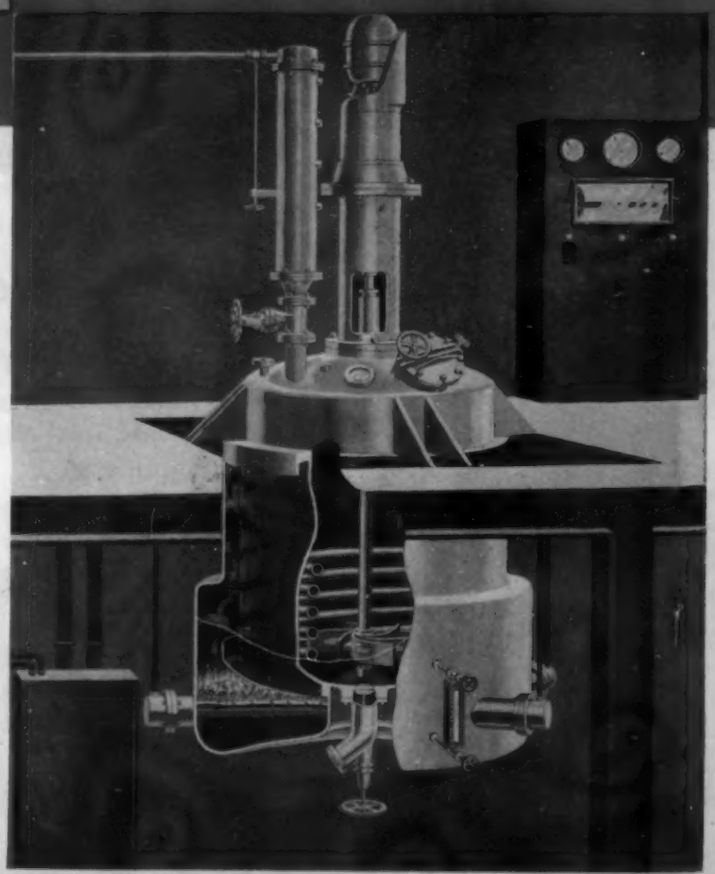
CONTROLLED HEAT

WITHOUT FLAME

BLAW-KNOX

ELECTRO-VAPOR

HEATING SYSTEM



The Blaw-Knox Electro-Vapor System supplies heat, closely controlled, through the entire temperature range of 100 to 700 degrees Fahrenheit. It combines the advantages of electric and Dowtherm heating.

Direct firing, with its well-known disadvantages, is eliminated.

The Electro-Vapor System operates with full efficiency at reduced loads, saves space, is explosion-proof, is simple in principle.

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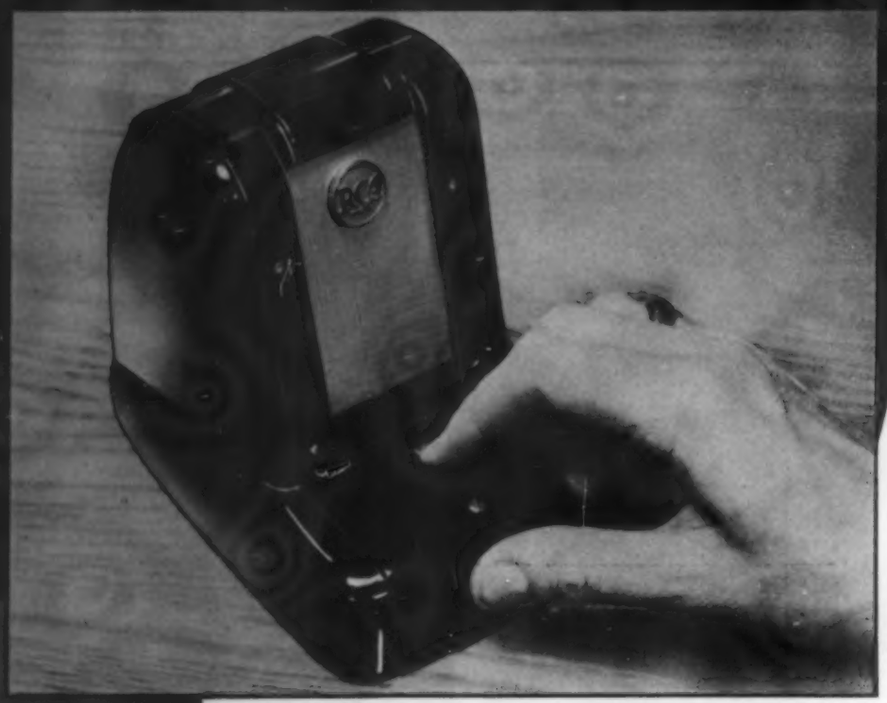

CREATIVE CUSTOM MOLDING

Plastic housing for an inter-office communication unit produced by CRUVER.

CRUVER CHICAGO

51st Year in Plastics . .

Cruver

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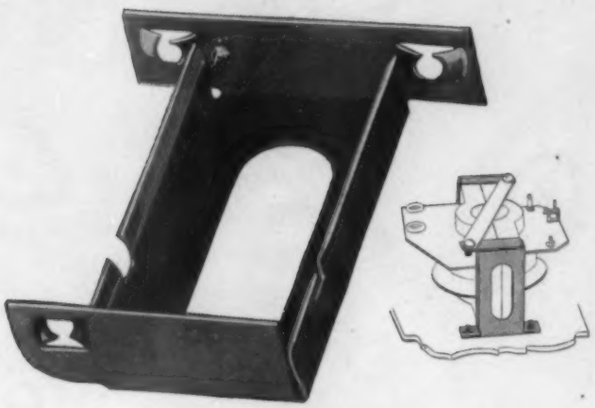
This is a SPEED NUT*.....

and



THIS is also a Speed Nut*!

Of course you recognize the Standard SPEED NUT shown above, but just look at the "nightmare" our development engineers dreamed up, to provide multiple fastening and operational functions in a single unit! It is used in the assembly and mounting of television transformers (see sketch) and you can readily understand its advantages over special mounting brackets and individual, hard-to-handle threaded nuts and lock washers.

In addition to the widely-used standard types of SPEED NUTS, hundreds more are *functionally* designed to combine assembly operations, eliminate unnecessary handling of parts, speed-up production and thereby reduce final costs. They are fabricated on specially designed, automatic machines which produce *completely finished* parts at high speeds.

There must be some step in the assembly of your product where, by changing over to SPEED NUTS your costs could be reduced and your product improved. Why not send us your assembly detail, or better still, send in the parts involved. We will be glad to give you a complete fastening analysis . . . at no cost.

TINNERMAN PRODUCTS, INC.
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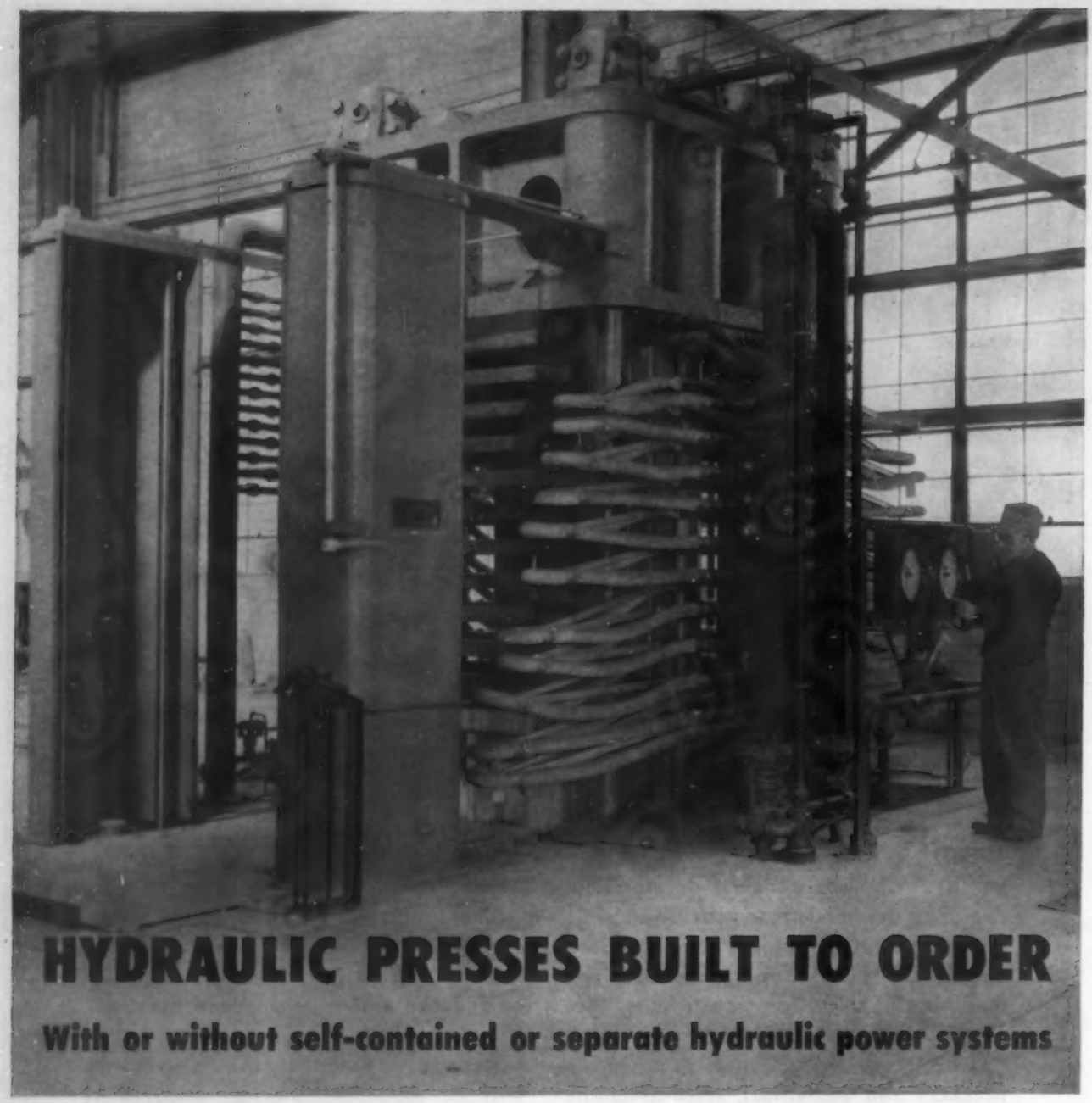
Speed Nuts* PATENTED

MORE THAN 4000 SHAPES AND SIZES

*Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS



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With or without self-contained or separate hydraulic power systems

If you want your press built "just so"—a press that will incorporate *all* the features you want—let Bethlehem help you plan it. We are fully equipped to build hydraulic presses, both large and small, and our experience in this field goes back many years.

Every Bethlehem press is a custom-made job. Whether you need one unit or many, call us when the work reaches the planning stage. Our engineers will be glad to act as consultants.

BETHLEHEM MAKES HYDRAULIC PRESSES FOR

PLASTICS WALLBOARD
FIBER BOARD VULCANIZING
METAL-FORMING
and other applications

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

UP-TO-THE-MINUTE . . .

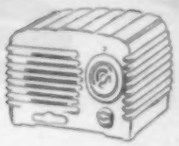
in a Cellulosic case

Case molded by Molded Insulation Company of Celanese "Celcon"

Designed for greater legibility, accuracy, durability, and beauty, the new Numechron electric wall clock is up-to-the-minute in every way . . . in an ethyl cellulose case.

Here, as for many other types of housings, ethyl cellulose is being chosen for its remarkable combination of light weight, dimensional stability, toughness, colorability, and the speed with which it can be injection-molded into deep and intricate shapes. Stable in form and finish, its resistance to kitchen heat and moisture is excellent.

If *you* are seeking to match improved designs with improved plastics and production methods, consider the cellulosics.



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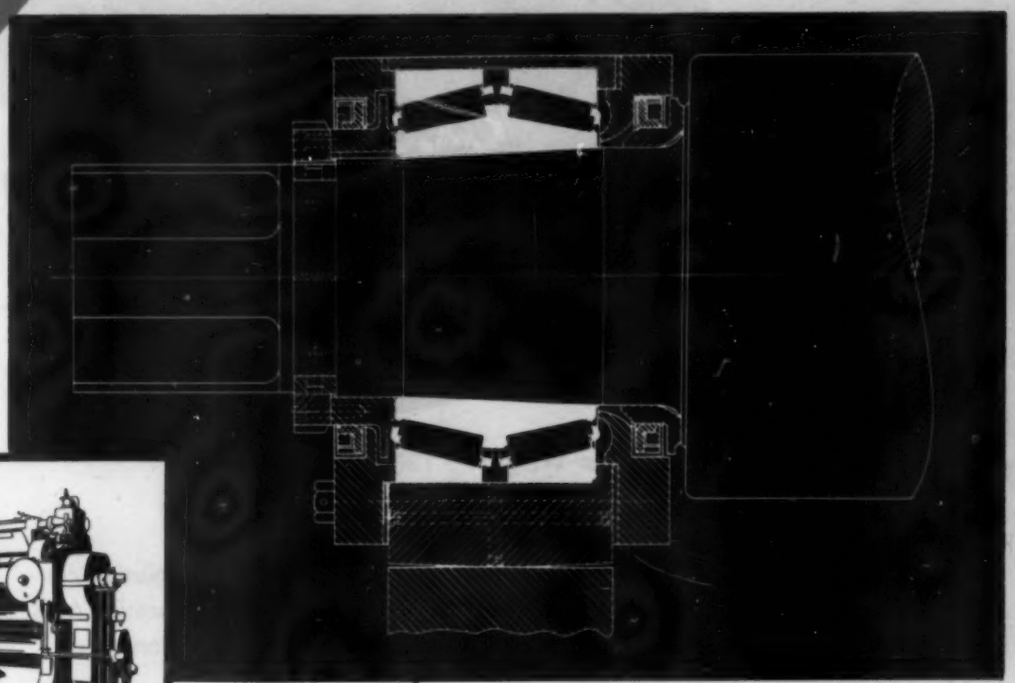

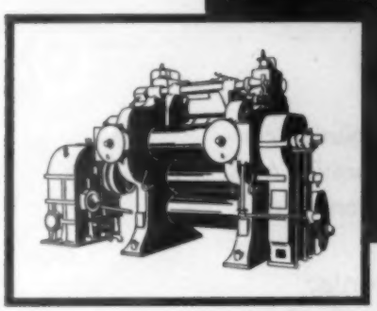

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It can be used as a raw material in the preparation of resins of various types.

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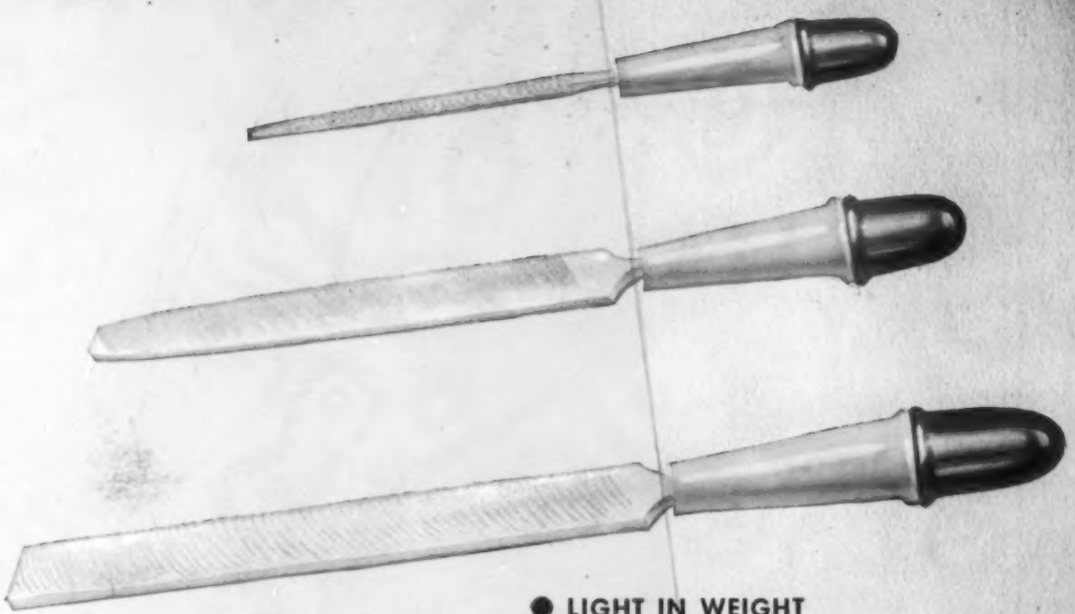

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MODERN PLASTICS
VOLUME 24 FEBRUARY 1947 NUMBER 6

Making and using thermoplastic laminates*

A METHOD of coating fabric with thermoplastic molding powder so that the treated material may be laminated and later drawn into various formed articles has now been developed to a point where the process holds promise of being applicable to mass production operations.

The new machine for treating fabric with thermoplastic molding powder preparatory to lamination is now in operation at the Parlin, N. J., plant of the Hercules Powder Co. The method involved is a process of hot melt coating eliminating the use of solvents. The machine consists principally of an oven through which an endless stainless steel belt carries molten powder and coats it over fabric.

Before its use in the machine, the ethyl cellulose or cellulose acetate molding powder is reduced to a very fine powder, of about the consistency of the flake, by mill grinding or a similar process. When ready for use, this molding powder is dumped into a hopper and fed to the coating machine through an automatic continuous weighing device which automatically feeds the right amount onto a vibrating feeder from which it is distributed evenly over the stainless steel belt.

Powder temperature reaches 450° F.

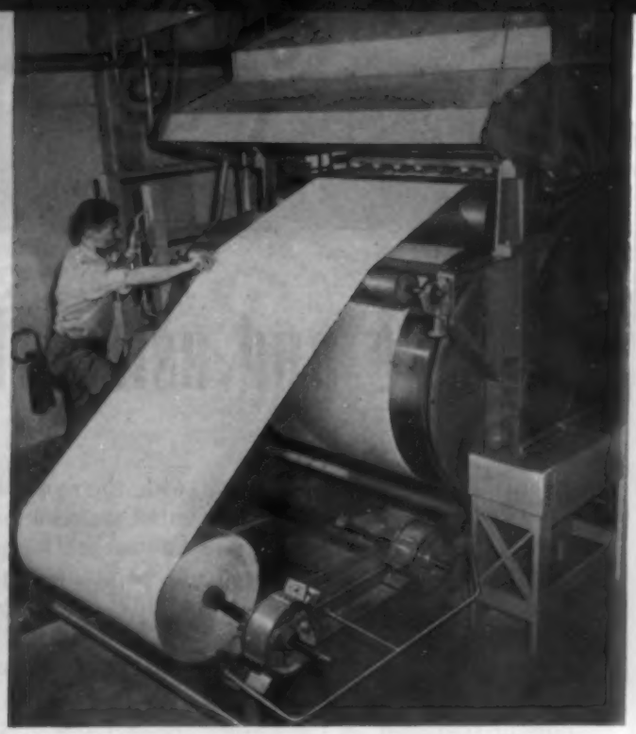
The belt then carries the molding powder through an oven which is heated with 250-watt infrared lamps. There are 170 light sockets in this 10-ft. long oven, but not all of them are in constant use because the heat has to be adjusted to various situations, depending upon the flow temperature of the molding powder.

The temperature from the lamps reaches a height of 400° F. But when the steel belt is heated, additional heat is generated so that the actual temperature of the molding powder reaches a high of about 450° F.

The textile or fabric does not pass through the oven. Immediately after its downward emergence from squeeze or pressure rolls, it comes into contact with the molten thermoplastic which is riding on the steel belt. The fabric is picked up by the hot plastic which naturally adheres to the heated metal band, thus giving a

* A paper on this subject was presented by R. J. Metzler of Hercules Powder Co. at the S.P.E. convention in Chicago on Jan. 29 through 31.

One of the applications for this thermoplastic laminate is a carrying case, molded in two parts, which is used in the transporting of equipment that architects employ to simplify the planning of kitchens



PHOTOS PAGES 91 & 92, COURTESY HERCULES POWDER CO.

Above left—View of oven which heats molding powders to a fusible state by infrared lamps. Above right—Cloth is being fed into the machine where it comes in contact with molten material riding on a metal belt

three layer substance consisting of fabric, plastic and steel belt. The loaded metal belt continues its journey over a roller and back under the machine to the other end of the machine. During this time the steel band cools so that the coated cloth can be stripped from it quite easily by tension rollers and either wound up or cut to the desired length. The fabric is thus coated on one side with a thermoplastic compound, the plastic and cloth ratio being about 70:30.

Production now three feet a minute

The machine turns out about three feet of coated fabric a minute. But this is a new and hitherto untried machine. With a few alterations it is expected that it could be run at a speed of three to ten ft. a minute, depending upon the kind of molding powder used and the end products for which the job is intended. If the oven were increased to 20 ft. in length and a longer belt installed, it is possible that it could deliver 20 ft. of coated fabric a minute.

There is a different method of coating thermoplastic laminates, developed by the Textileather Corp., Toledo, Ohio. This second method is a modified dry resin process which, however, gives the same end result as the Hercules method.

From coater to laminating press

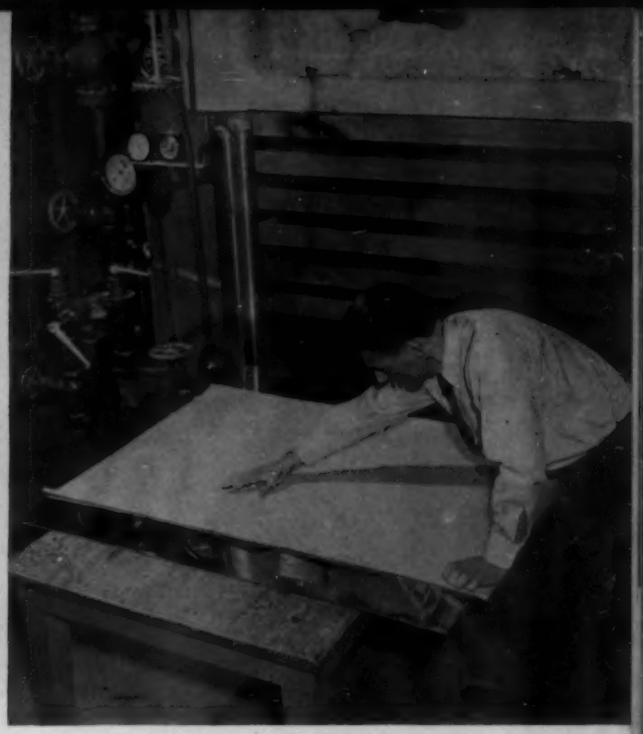
After the fabric has been coated by either method, it is ready for the laminating press which is the same type hydraulic press used in any laminating plant. Only 100 p.s.i. are required in this work since the plastic is heated to a fluid state when pressure is applied. Since the products are thermoplastic, the laminating cycle is simply a heating and cooling operation rather than a curing operation. This makes it appear as though a continuous laminating process is possible. One commercial company is already laminating on a 10 sec. cycle.

The thickness of the laminate is governed by the number of plies. Present applications require an average fabric thickness of 0.09 in. but thinner material could be processed depending upon the properties needed in the end product. In the layup the top and bottom plies are pressed against polished steel surfaces. With material in press and during heating up, platens and material are subjected to a steam pressure of about 135 lb. for five to six min. until they acquire a temperature of about 350° F. Less than 50 p.s.i. is applied to the laminate during this heating cycle. After this preliminary heating, the pressure on the laminate is increased to about 100 to 150 p.s.i. and left for about five min. to drive the molten plastic into the fabric.

It should be pointed out that the action which takes place here is quite different from a thermosetting laminate wherein the character of the impregnated sheet becomes different from that of the original paper or fabric. In this thermoplastic laminate the sheet of fabric or material is merely coated with a plastic material which is forced into the sheet itself without changing its character, except to give added strength, rigidity or other desired properties.

Forming the finished laminate

After a sheet has been laminated, it can be drawn into a large variety of shapes. The principal finished products that have been made to date from this material are suitcases, miscellaneous cases, housings, lamp shades and automotive interior trim. Five-inch draws



Above left—The stripper roller in the foreground separates the coated cloth from belt. At top, a worker pours molding powder into hopper that leads to the feeder. Above right—Laying up a piece of laminate

with sharp corners have been made successfully and much deeper draws have been achieved in parts with larger or rounded corners—as in dome-shaped products.

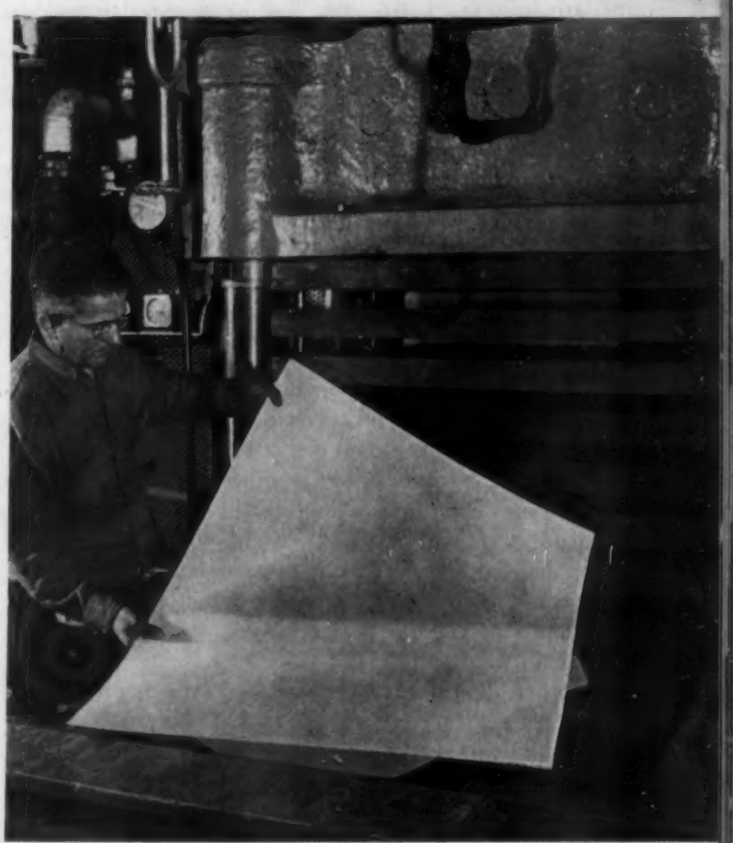
In preparing the laminated sheet for drawing, it is heated in an oven with infrared lamps or similar equipment to a temperature of about 325° F. It will be noted that this is the third time the thermoplastic has been heated; a continuous process would conserve heat. When the laminate has reached the proper temperature, it is placed in a drawing mold not unlike the type used for drawing metal.

The Hercules Powder Co. recommends the use of a clamping ring or pressure pad which covers the entire pattern. The pressure on this ring is governed by air cylinders rather than springs to simplify the adjustment of pressure—adjustment which is necessary to accommodate different laminate constructions.

Wooden molds have been used successfully for experimental cases; and as many as 120 draws have been made in one mold. Wood is not, however, recommended for longer runs. But the use of wood does offer an inexpensive method of making sample runs; the wooden dies can then be used as patterns for constructing metal dies.

Unnecessary corners of sheets to be drawn are cut off before the laminate is placed in the mold, in order to avoid the necessity of having to control material which is not part of the finished article. This minimizes any tendency toward development of wrinkles. In other words, by using patterns to cut the laminate to a specific size and shape, any part is easier to draw because there is a minimum of material to be controlled.

Pressure for the draw can be applied by any method available—air or hydraulic cylinders, for example,



In a thermoplastic laminate such as this, the fabric is merely coated with the plastic material which is forced into the sheet without changing its character except to add strength, rigidity and some other desired qualities

A suitcase and a vacuum bottle carrier are both made of fabric laminated with cellulose acetate compounds. Although the material is not as flexible, it has the appearance of leather, is strong and stain resistant

clamping or any other suitable method. Thus, if other means are available, it is not necessary to have a compression or hydraulic press, though such presses are, of course, the most convenient for this work. One commercial operator has been able to make three draws a minute using automatic equipment.

Material for the laminate

The fabric used for thermoplastic coating will depend on the end use for which it is intended. Rayon is a desirable fabric for surfacing because it is more decorative than cotton and one of the ideas behind this development is to preserve the appearance of the original fabric. The more attractive the fabric, the more beautiful the final product. Eight to twelve ounce rayon has been used in hot pressed laminates. The strength of the cloth is, of course, a factor influencing the depth of the draw. If only a shallow draw is needed a weaker fabric can be used.

Another desirable feature of this type laminate is that a colored layer of acetate may be laminated with the coated fabric so that almost any desired color or decorative combination may be obtained. If the end use requires a solid color rather than a figured fabric pattern, this is also possible. Both sides of the fabric can be coated if such a job is needed, only slight changes in coating technique being required.

Possibility of mass production

It is possible that this coating and laminating operation may be reproduced on a vast mass production basis. In such a setup there might be four lines producing coated fabric, all feeding their material into a large machine where the four sheets could be squeezed between rollers and laminated together, thus producing a finished laminate in almost one continuous action.

Advantages and limitations

Developers believe these thermoplastic laminates have several advantages over thermosetting or polyester low pressure laminates because of the toughness gained by combining cellulose derivatives and fabric which enables a processor to make strong and deep draws. These men think the laminate has more satisfactory color possibilities because almost any figured fabric can be used, covered, at times, with a solid color thermoplastic sheet. In addition to versatility of color and fabrication, the physical properties can be varied over an extremely wide range by proper selection of laminating materials.

The developers also admit certain weaknesses, such as the present inability of many thermoplastics to withstand outdoor weathering. There is also a rather large amount of waste gathered from the flare which is cut off from around the edges of the mold when the material is being drawn. However, it is possible that this scrap could be used as a filler for a laminate of a different construction.

As in all textile-filled laminated structures, water absorption by the textile must be minimized as much as possible. Good dimensional stability comparable to some thermosetting laminates can be obtained when

the edges of the thermoplastics laminate are sealed with lacquer or a similar suitable compound.

Principal end products

Principal end products made to date have been suitcases, lamp shades, sales kits, electrical housings, miscellaneous cases, and portable and experimental loud speaker housings. In thin sections, cellulose derivative laminates produced by the familiar wet process lay-up method are now used in lamp shades where dimensional stability under heat, toughness, and ability to be cleaned with soap and water are important properties. A solenoid cover requiring extreme toughness combined with excellent electrical properties was made for the Army. On a Navy application, hemispheres 10 ft. in diameter were made to a tolerance of 1 in. in 10 feet. The laminated material for these two applications was turned out by the Textileather Corp. Expendable gas tanks employing rayon as the fabric were ready for production toward the end of the war. Claims were made that these tanks exhibited the extreme toughness necessary for them to withstand the pounding from coral rock on beaches when airplanes took off and landed, and that they had added features of lightweight and smooth lines for high speed flight.

Other prospective applications requiring a combination of lightweight, strength and drawability are ethyl cellulose laminated fabric air vents and fairings for airplanes; inside refrigerator panels; deep drawn or fabricated thermoplastic housings for electrical equipment where a 90° joint may be accomplished easily by heating the edge of the sheet and bending it at a right angle; decorative flat surfaces. Luggage, as mentioned previously, offers wide outlets for this material because of the possibility of embossing designs and of stamping out or drawing the case in two simple operations.

Typical examples of the case-type application are shown on page 91 in the illustrations accompanying this article. The Plan-A-Kit case, used by architects to demonstrate a model kitchen, is fabricated for American Kitchens by Crosdale & de Angelis, Inc., Upper Darby, Pa., from Textileather Corp.'s thermoplastic coated fabric. The case is 22 in. square with sections 1 in. deep. The inner tray is blown vinyl. Edges are trimmed with stainless steel molding and the two pieces are fastened together with a piano hinge on the back and with leather handles in front. Ridges, incorporated in the design, give added stiffness. The kit was formed on a compression press, 40 p.s.i., and a 1-min. cycle. The mold formed from Kirksite was good for 10,000 pieces and is still usable.

The vacuum bottle carrier on page 94, fabricated by Clark Leather Products Co. of Chicago from Textileather Corp.'s laminate, is lightweight, rugged, includes a separator to divide the two bottle compartments and is stainproof against such liquids as coffee and milk. The suitcase, shown on the same page is another example showing the possibilities of deep drawn cellulosic laminates.

It is believed that thermoplastic laminates can be particularly useful in the automobile industry for such applications as arm rests, trim around the bottom of the seats, the base of door panels, sun visors and head linings where the cellulosic plastic surfaces would be wear-resisting, colorful and easily cleaned.

Unreinforced cellulose-derivative plastics have always been known for their toughness and high resistance to breakage by impact; reinforcing with textiles generally doubles these strength properties. If the laminate is properly constructed its water absorption and dimensional stability characteristics are similar to those of the binding plastic. Under severe temperate zone conditions of 168 hr. at 140° F. and 80 percent relative humidity, laboratory data indicate that ethyl cellulose laminates have equivalent stability to the older Grade C phenolic laminates.

Cost of thermoplastic laminate articles

Price position of thermoplastic laminates can be judged only on the basis of the value of the finished article. Misconceptions are liable to develop if only the raw material price is considered. For example, manufacturers and designers sometimes resist the adoption of plastics on the basis that it is more expensive per pound than sheet steel. Yet if color is to be had with steel, the steel must be cleaned, then surfaced and primed before the finish coats can be applied. If the lacquer or other coating is scratched during assembly operations, it must be repaired. Besides forgetting the finishing costs of steel, many persons overlook the production speeds achieved with many plastics.

The economy of touching up plastic surfaces which have been spoiled by the screwdriver of a careless workman has already been proved in the automobile industry. It has been told that the marred part in metal must be dismantled and returned to the finishing shop for touch-up. With plastic, a buffing wheel corrects the damage without removal of the part, thus effecting a considerable savings.

Cellulose-derivative laminates, in addition, are very easy to fabricate and lend themselves to straight-line production processes. Plastic from laminating equipment can be fed directly to drawing equipment making fast, low-cost production processes possible. As reported previously, one manufacturer has reported cycles of as low as 10 sec. for the laminating of flat sheets. Since only 100 p.s.i. are required to laminate the plastic and 10 p.s.i. to draw it, high investment in expensive equipment is not necessary. Add to this low equipment cost the rapid cycle, and the investment cost per pound of material produced is very small.

Beautiful lasting colors, serviceability, toughness and ease of fabrication are the usual combination of properties offered by plastics; the cellulose-derivative laminates possess all these properties. All add appeal to the finished product. If laminated cellulose derivatives are used where they fit the requirements of their assignment, these properties provide added tools for the salesmen and advertising men seeking their share of the consumer dollar.

Silverware chest

PHOTO, COURTESY MARSHALL-WHITE CO.

This two-piece molded urea chest, whose light color will not wear off, is something new in the field

ONE OF the trends in the plastics industry during the past year has been toward much larger molded pieces, both phenolic and urea. How this can broaden the field of plastics application is exemplified by the two-piece molded urea silverware chest shown in the illustration above which marks the introduction of plastic materials to an entirely new field.

Three advantages of plastics

Marshall-White Co., Chicago, which developed and markets this chest, has found the plastic product to possess three advantages over the standard wooden models. In the first place, the urea box is new—always a valuable selling point. Secondly, its *permanent* ivory color sets it in striking contrast to the average dining room furniture, giving it a definite decorative value. The lightness of the color also obviates the worry attendent upon the purchase of a wooden chest when the question of selecting a grain to match that of the furniture often arises. Painting can impart this same advantage to wooden chests, but then the color is not *permanent* as in the molded plastic case. A little use is liable to leave disfiguring scratches on the painted surfaces. Finally, by using plastics rather than wood for these silverware boxes, the company was able to use complicated engravings on the lid—decorations that would be prohibitive from a cost angle if they were attempted on wooden chests.

Testing the market

These advantages seemed obvious to Albert Sloan, vice-president of the Marshall-White Co., when he first conceived the idea of putting plastics in this new application. But there was a question whether furniture and jewelry buyers and department stores, outlets through which the company markets its products, would agree that these features were *advantages*. Rather than risk costly failure, Mr. Sloan had top designers create patterns for the chest and its cover. The best of these designs were then transferred to plaster models of the proposed molded urea chest and photographs taken. With these he canvassed the country querying the buyers on their attitudes toward the use of plastics in this application, on their preferences in design, on their opinions as to public acceptance.

Only when he was convinced that buyer reaction was

molded of UREA for beauty . . . utility

A permanent light color going all the way through, and light weight are advantages of this new chest

"How soon can we have them," did Mr. Sloan (with the approval of I. S. Berlin, president) start to translate the plaster models into finished molded chests. By this sound approach to a new idea the company protected itself against the possibility of costly failure. It got buyer and, through the buyers, it got customer reactions before investing money in the machining of the molds and in initial production runs.

Design and development of first chest

At present the company is marketing two models of the molded Plaskon and Beetle chests which differ only in cover design. One is known as the Estate, the other as the Cameo model. A third design for a molded urea chest is now on the drawing board. All the boxes have practically the same overall dimensions, measuring $17^1/_2$ in. in length by 12 in. in width by $3^3/_4$ in. in depth and weigh 5 lb. 6 oz. The lid weighs approximately one pound less than the bottom section.

Just as the sales have been divided between two designs, so production has been split between two plastic molders—General American Transportation Co. and Plastic Molders, Inc., both of Chicago, Ill.

General American Transportation Co. undertook the production of the first of these silverware boxes. Starting with the artist's drawings and a plaster model, this company built the molds, machining the ornamental work for the cover design. The molding itself was complicated by the size of the pieces, by the intricate relief pattern and by the close tolerances that had to be maintained to insure a snug fit between cover and base.

From the beginning, the molders worked closely with Klingberg & Hester of Chicago, the designers, in the solution of design and mold problems. The cooperation between designer and molder was even closer in the case of Plastic Molders, Inc., since the design firm entered the picture a little early in the development of this second silverware chest. (*Please turn to next page*)

There are two cover designs. One was engraved by hand except for edge fluting; the other was machine engraved

To give the two pieces the necessary strength, ribbing is molded in the underside of both cover and base section

The second box design

In the production of the second design, the molder, Plastic Molders, Inc., let out the contract for the tooling to the Enduro Tool & Engineering Co. and Comet Engraving Co., both of Chicago, Ill. According to officials at Enduro, one of the principal problems was that of getting a perfect match between the covers and the bottoms since the pieces are quite large and great care had to be exercised to obtain the correct dimensions. The molds on both the cover and the base section as built by this company are somewhat unusual in that they are part positive and part semi-positive. The thin lip, or dust lip, which goes all the way around the cover, naturally called for extremely accurate machine work in the making of the molds. Incidentally, the holes in the finished pieces which are used to hold the felt lining in place are formed by core pins in this second chest. In contrast, General American Transportation Co. drills these holes after the parts are removed from the molds.

The particular contribution of the Comet Engraving Co. to the success of the second silverware chest lies in the hand-executed engraving work done on the lid section. Theirs is the design on the center and edge of the lid. The fluting around the edge of the bottom section represents machine work of the Enduro Tool & Engineering Co. It is interesting that all ornamental work on the first chest was machined by General American Transportation Co.

Molding the two parts

Both molders on this job use loose Plaskon and Beetle molding powder; and both employ single cavity molds for each of the two pieces. To insure a good color match between the cover and the bottom section, Plastic Molders, Inc., measures out enough powder for both pieces and then divides the material between the two cavities.

This molder of the second silverware chest uses somewhat low tonnage in the molding of the two parts—both pieces being produced, side by side, on 400-ton presses. In this plant the complete molding cycle averages around 4 minutes. At General American Transportation Co. a compression type hydraulic press is used.

As can be seen by the illustration on the preceding page, the cover of the chest has rather heavy ribbing molded on its underside. A similar construction is employed on the underside of the base section. In this way the manufacturers have assured themselves of a sturdy box that can withstand the usual handling to which chests of this type are subjected, as well as hold its own as a decorative item.

The finishing operations at both molding plants are uninvolved. The only really delicate work is the wiping in of color on the cover design to give a soft antique effect. Flash, of course, must be removed and the piano type hinge screwed into position. Insertion of the special felt lining, that holds the silver in place and is so treated that it prevents all tarnishing of the contents, is the work of Marshall-White Co. This lining has been approved by *Good Housekeeping* magazine.

A truly "quality" product, this urea silverware chest is finding quick acceptance by the buyer and the general public. In fact, the problem today is that of turning out the boxes fast enough to meet the demand of the retail market.

A lamp shade that glows in the dark

A friendly glow, to light the path of the person leaving the room, is cast by this lamp shade made of Marcolite. The material, manufactured by Marco Chemicals, Inc., Sewaren, N. J., is a low-pressure laminated sheet using MR resin and glass floss. A coating of phosphorescent pigment is applied to the finished material. It is this coating that becomes activated with exposure to artificial light and causes the shade to glow in the dark long after light has been extinguished. As the intensity of the afterglow decreases, phosphorescent blue will turn to white.

Luminous and plain Marcolite material is obtainable in red, green, yellow, blue, tan and off-white. It is also available in various phosphorescent shades. In daylight the material has an interesting pattern—the weave of the glass cloth causing it to appear like old parchment. The shade shown in the accompanying illustration was fashioned by Luminart Lamp Shade Products, Inc., of New York City.

To take full advantage of plastics and economies of molding, this redesigned polystyrene box was made square in shape. Urea replaced wood in cap

Redesigning talcum container for plastic

TAKING full advantage of plastic material, the new container for Sportsman Talc is square, has an attached lid, fluted grooves on each side to give graceful modern lines, and according to John Hudson Moore, Inc., New York City, is more convenient to use than the old style container.

In 1945, this company switched from a rectangular glass container to one of polystyrene but in the change-over merely duplicated the glass style, wooden screw cap included. Contours were the same and at first glance, it was hard to distinguish between old and new.

But the new box was developed with the characteristics of plastics in mind. Almost the only element left unchanged is the decorative design on the container which is in the nature of a trademark for the product. Feature of the newly designed container is the snap-on lid. Both the cap and the top of the body are grooved and when the lid is snapped on, it remains firmly in place. Slot-like openings in the lid and in the top of the body are so positioned that the powder can be dispensed by a slight twist of the cap. The ease with which the lid can be turned is assured by the powder it dispenses since the powder acts as a lubricant.

The new shape and the non-removable lid, which can not be misplaced, is felt to have more masculine appeal than the former design. Container is smarter in appearance, easier to handle and more suited to molding.

The container is molded in three parts by Prolon Plastics, Div. of Pro-Phy-Lac-Tic Brush Co., Florence, Mass. The body and the bottom of the talcum box are injection molded of polystyrene; the cap is compression molded of urea. The bottom piece of the container had to be formed separately since the box is filled through this opening. A solvent—propylene dichloride—is used to secure the bottom piece after filling.

The container body is bright green, of a somewhat lighter hue than in the former design; the cap is chocolate brown. The multi-colored game bird design, like that on the old box, is silk screened on the front panel by Creative Printmakers, Inc., New York City. The box harmonizes with the glass-packaged items and blends in nicely to complete gift-set packages.

The first polystyrene container made for this men's talcum was but a duplication of the original glass bottle

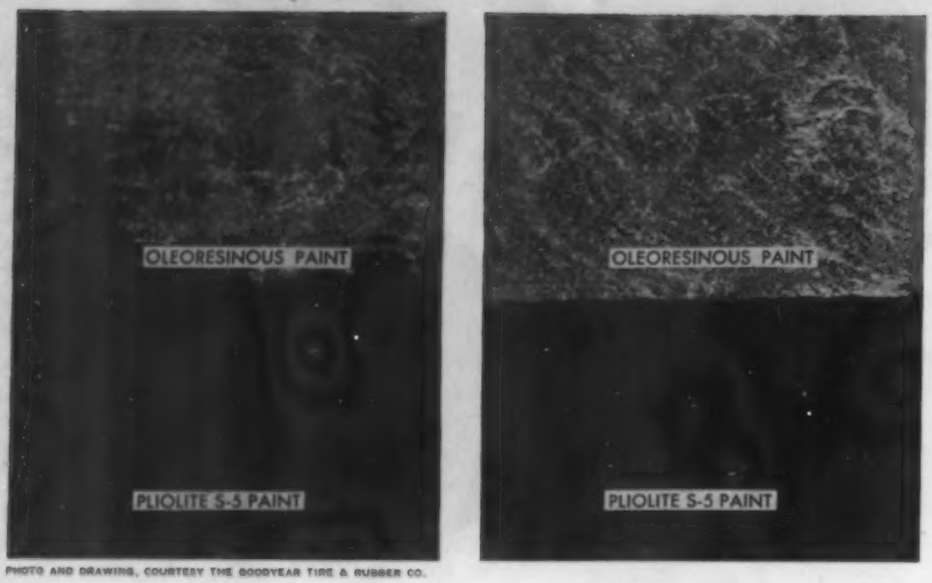


PHOTO AND DRAWING, COURTESY THE GOODYEAR TIRE & RUBBER CO.

These transite panels were scrubbed an equal number of times with stiff brush and two percent alkaline solution. Left—Effect of 5,000 scrubs. Right—Effect of 540,000 scrubs. In both cases the copolymer resin paint was still in an excellent condition

Thermoplastic specialty resins*

by Wm. H. AIKEN†

ONE of the older trade names in the thermoplastic field, Pliolite has in recent years acquired a broader meaning. The resin, prepared by the cyclization of natural rubber which was introduced to the trade under this name in 1933, is still available. But, in recent years, several new synthetic resins have been introduced under the same name followed with the suffix *S*. These resins include both cyclized resins and copolymer resins. Thus, Pliolite S-1 and S-2 are cyclized synthetic rubbers; Pliolite S-3, S-5, S-6 and S-7 are copolymer resins. The entire family consists of a group of specialty resins that are useful in many fields of application.

Cyclized synthetic rubbers

When a solution of natural rubber is heated with a suitable catalyst, the rubber loses part of its chemical unsaturation, the solution viscosity of the material decreases and the rubber gradually goes over into the resinous state, as shown by an increase in softening point. Resins prepared in this manner have been called cyclized rubber, isomerized rubber and rubber resin. Cyclized products which vary from soft rubbery materials to hard brittle resins are possible. The resin supplied as Pliolite is cyclized to a degree to give optimum properties of solubility, solution viscosity, hardness and compatibility with other materials.

Pliolite is a light amber colored resin. Since it is prepared from the highest grade pale crepe rubber, it is odorless and tasteless. It is soluble in aliphatic hydrocarbons, aromatic hydrocarbons, chlorinated hydrocarbons and terpene hydrocarbons.

Solution viscosity can be reduced by working the resin on a rubber mill. A 20 percent solution of the milled resin in naphtha is quite fluid. A number of materials are of limited compatibility with this resin and can be used to modify its properties. Terpene resins, modified styrene resins, rosin, rosin acid esters, cumarone resins, alkyd resins, phenolic resins, maleic resins, mineral oil, drying oils, paraffin waxes and microcrystalline waxes are all somewhat compatible with it. X-ray diagrams have shown that 10 percent paraffin can be added to this resin before the crystalline diagram of the paraffin becomes evident, indicating complete solubility of small amounts of wax in resin.

Uses—Pliolite is a specialty resin which has found widespread use in the paper coating, rubber reinforcing, paint, adhesive and hot melt fields. Manufacturers of high grade lacquered papers agree that the combination of properties given by paper coatings of this resin are unequaled by other protective paper coatings. These paper coatings give excellent resistance to the passage of water vapor, excellent adhesion to the paper, excellent heat seals and good surface characteristics.

Glassine paper, coated with 1 lb. of Pliolite per 1000 sq. ft., will transmit only 0.25 gram of water/100 sq. ft./24 hr. at 100° F., when one side of the paper is exposed to 92 percent relative humidity and the other to 20 percent. When such a coated paper is heat sealed to

* A paper on this subject was presented by Mr. Aiken at the S.P.E. convention in Chicago on Jan. 27 through 31.

† Assistant manager, Plastics & Coatings Department, Chemical Products Division, The Goodyear Tire & Rubber Co., Akron, Ohio.

itself the bond is so strong that the paper will be torn if an attempt is made to rupture the bond. These coated papers are used to protect many foods from atmospheric moisture, including potato chips, pretzels, bread, salt.

This resin was the first to be used successfully for the reinforcement of rubber. By inclusion of 10 to 20 parts of Pliolite in rubber formulations, hardness, abrasion resistance and tensile strength can be improved without the use of carbon black, thus making possible many rubber items in colors that would otherwise be impossible. Addition of this resin to rubber stocks greatly improves their processibility and prevents shrinkage of calendered and extruded items. Before the war the resin was used to improve hardness and impart resistance to such items as football helmets and shoulder pads and proved to be a valuable modifying agent for Balata in golf ball covers. During the war it served efficiently as a stiffening agent in the walls of bullet sealing fuel tanks, as an extrusion aid in wire insulation.

Pliolite paints are characterized by their chemical resistance. Concrete enamels or industrial finishes with this resin are in good shape after years of abusive use.

It is soluble in melted petroleum waxes and, when the wax solidifies, it imparts reinforcing properties. Additions of small amounts of the resin to paraffin used for coating bread wraps prevents the wax from scuffing even in hot climates. Hot melts prepared from this resin and waxes give tough coatings that can be applied to cheese by dipping—protecting it from drying out.

Pliolite S-1 and S-2—When our natural rubber supply was cut off by the Japanese, pale crepe rubber was unavailable for the manufacture of Pliolite except for applications carrying the highest priority. Cyclization of a number of synthetic rubbers gave products of little interest. It was found, however, that polyisoprene (which is chemically the same as natural rubber), when cyclized, gives a product with many of the characteristics of Pliolite. Cyclized polyisoprene prepared with the same catalyst used in the preparation of Pliolite was introduced to the trade as Pliolite S-1. Cyclized polyisoprene prepared with another catalyst has been designated as Pliolite S-2, although its properties are substantially the same as that of S-1.

S-2, the material which is currently available, has substantially the same solubility and compatibility characteristics as the original resin. The outstanding difference is solutions of unmilled and milled S-2 formulations have lower solution viscosities than Pliolite.

Because it lacks the necessary adhesion, the S-2 resin is not recommended for paper coatings or paints. It does impart good reinforcing properties to rubber and synthetic rubbers and has been successfully used in this field. Cheese is being protected with this type coating.

Recently there have been introduced to the market a number of inks based on the S-2 formulation which many ink chemists believe will revolutionize lithographic printing. Unlike drying oil based inks which require many hours to dry to a hard tack-free film, these inks dry instantly without the application of heat. Excellent half-tone reproduction is obtained. Freshly printed sheets may be stacked on top of each other without danger of offsetting and the reverse side may be printed after a few minutes instead of after the hours or days required for drying oil inks. These inks based on the S-2 resin dry to a hard surface that neither scuffs nor smears. Another advantage of these inks is that they have excellent press life—that is, the press may be stopped without cleaning up, and the ink will still be in a condition to print after hours or even days.

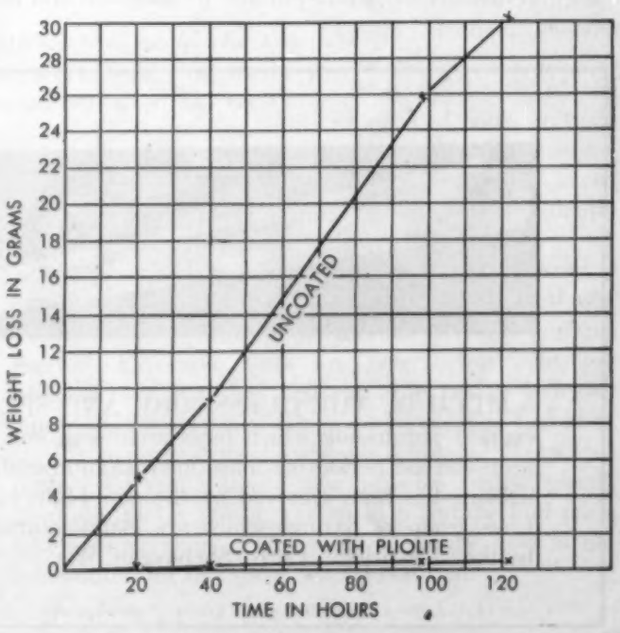
Copolymer resins

Pliolite S-3—In the last few years tens of thousands of polymers have been made in the search for better synthetic rubbers. While many of these polymers are of no interest as synthetic rubber, at least a few of them show great promise in the plastics field. Pliolite S-3 is one of these materials, and it has found widespread usage as a rubber reinforcing resin. It is a hard resin which contains 15 percent butadiene and 85 percent styrene. (GR-S, produced by the government for tires, contains 75 percent butadiene and 25 percent styrene).

Solvents which dissolve this S-3 resin completely have not been found, but it is partially soluble in aliphatic and aromatic hydrocarbons. It is compatible with natural rubber, GR-S, Buna N, neoprene, butyl, Balata and polyisobutylene. For many applications it is the equal of Pliolite for reinforcing natural rubber and superior to it for reinforcing many synthetic rubbers.

In the extrusion of thin walled insulation or electrical wire, it is difficult to obtain a uniform rubber coating that is correctly centered. Addition of a few percent of Pliolite S-3 to the stock results in greatly improved extrusion, uniform wall thickness, absence of shrinkage on cooling, faster extrusion rates. (*Please turn to next page*)

Resistance to water vapor is shown below for uncoated glassine and glassine that is coated with copolymer resin



Many molded rubber items must possess a certain amount of rigidity, yet not be brittle. Addition of the S-3 resin to the rubber stock not only gives the desired degrees of stiffness and toughness, but also aids in flow of the stock in the mold. Example of such an application is the sink strainer that is available in many colors. High grade golf ball covers are prepared from Balata. Addition of the S-3 resin to the golf ball stock improves moldability, hardness and cut resistance.

Rubber compounds for calendering on to fabrics are improved in processing characteristics by the addition of this resin. It is, in fact, recommended for all rubber and synthetic rubber formulations where improvements in hardness, stiffness, abrasion resistance, processability and absence of shrinkage are required.

Pliolite S-5—This is a copolymer hydrocarbon resin that was developed specifically for paint applications. It is soluble in aromatic hydrocarbons, chlorinated hydrocarbons, terpene hydrocarbons, nitroparaffins, esters and ketones. A solution in aromatic hydrocarbon may be diluted up to 50 percent with aliphatic hydrocarbons without appreciable increase in viscosity. It may be plasticized with drying oils, chlorinated paraffin, chlorinated diphenyls and ester type plasticizers.

The outstanding characteristic of paints prepared from this S-5 resin is their chemical inertness. Panels painted with Pliolite S-5 paints have been submerged for months in dilute solutions of various acids and alkalis with no ill effect. This excellent chemical resistance makes paints based on the S-5 resin ideally suited for such applications as acid and alkali resistant coating, concrete floor enamels, architectural finishes, metal primers and finishes, oil and grease-resistant coatings, baking primers and enamels, corrosion resistant coatings and ship bottom paints.

When conventional oleoresinous concrete enamels become wet for extended periods of time, the alkali of the concrete reacts with the oil of the paint to cause blistering; eventually the paint will lose its adhesion and be washed off. Concrete panels painted with the S-5 resin have been submerged in water for weeks with no ill effects. Alkaline cleaners and strong soaps that discolor or remove conventional concrete enamels have no effect on concrete enamels based on this resin. A special vehicle prepared from it is recommended in flat wall paints for interior concrete and plaster walls.

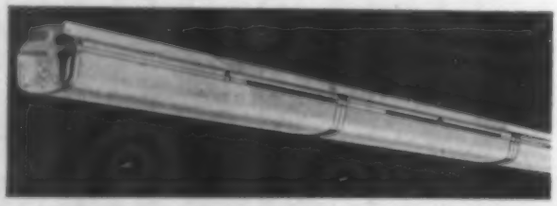
Pliolite S-5 is being used as a base for inks for silk screen printing and shows promise as a base for inks to be used in printing plastic film.

Pliolite S-6—This is a copolymer hydrocarbon resin recommended for use as a rubber reinforcing agent. It is especially well suited for imparting hardness, abrasion resistance and flex life to rubber stocks to be used in shoe soles, heels and top lifts.

Pliolite S-7—A thermoplastic, synthetic, copolymer, hydrocarbon resin, it possesses properties which make it well suited for paper coatings. When properly compounded it gives coatings which have excellent resistance to the passage of water vapor, good crease resistance, heat seals and adhesion to a variety of papers.

This resin is readily soluble in a variety of commonly used solvents, and paper coatings of any desired drying rate can be formulated. The solution viscosity varies somewhat with the solvent employed, but in general a 20 percent solution in aromatic hydrocarbons is a good coating consistency. Ketones in general are good solvents for this resin and give solutions of lower viscosity than aromatic hydrocarbons. Solutions of Pliolite S-7 are very stable and do not change in viscosity on aging.

Formulations of this resin require the addition of a small amount of wax (10 to 15 percent) to insure the best resistance to the passage of water vapor. Best results are obtained with microcrystalline waxes with melting points of about 170° F. Pliolite S-7 can be modified with a number of resins. Cumarone-indene resins, modified phenolic resins, modified styrene resins and rosin esters have all been found to impart quite interesting properties.



MUCH OF THE GUESSWORK AND SPECialized purchasing which faces architects, engineers and contractors in connection with fluorescent lighting has been removed by the new Light-in-Line group of fixtures which are manufactured by the Moe-Bridges Corp., Sheboygan, Wis.

Line consists of four base strips for open lighting, comprising two-light 40 watt model, two-light 100 watt, four light 40 watt and four-light 100 watt. Each combines with louvred attachment or with glass and plastic enclosures to provide a complete line, individually packaged, with minimum inventory.

The plastic shield fixture is fabricated from white translucent Vinylite sheet. The material was chosen because of good dimensional stability, excellent light transmission without glare, light weight and low breakage rate in shipment and use. Installation and maintenance of these fixtures are said to be easy.

Molded plywood makes this desk

MENTION molded plywood furniture, and there are those who think immediately of ultra modernistic pieces. But that type of application does not by any means exhaust the possible uses for this material and method of forming. Depending on the design, molded plywood furniture can be made to harmonize with the most extreme or the most conservative interior furnishings. Or it can be formed with the flowing functional lines that will fit any type of decor and become a handsome asset to an office or livingroom.

Into this last category falls the molded plywood desk of the Plymold Corporation of Lawrence, Mass. This piece possesses more than the beauty of line and finish that fits it for home or office use. It has, in addition, a remarkable structural strength and a hard surface that can withstand more than normal abuse and wear.

There are seven parts in all in this nine-drawer desk. These are the top, the two U-shaped side sections that hold the drawers, the two drawer fronts (each of which is cut after forming into four pieces), and the combination drawer sides as well as the back pieces.

Molded plywood comprises top of this desk, the two U-shaped sections holding drawers, and the drawer fronts which are made in two pieces, then cut to size

The front and back of the center drawer are cut from flat plywood strips, while the bases of the two drawer sections are both solid pieces of wood.

Either maple, mahogany, walnut or light birch veneers are used in the construction of this desk. The number of plies varies according to the piece being molded. For the drawer fronts, from nine to eleven plies are used. In contrast, only five plies are employed for the top of the desk and also for the two side sections.

Phenolic or urea resin glue is used in the bonding of the veneers. It is applied to the wood in a special spreader after which the wood veneers are passed through rollers to remove the excess resin. Then comes a short period during which the coated wood is allowed to dry.

Plymold Corp. has developed a mechanical process for the molding of this desk but, with patents still pending, few details of the construction or operation of the unit are, as yet, available. It is known, however, that high-frequency heating is used and that wooden, molds are employed to form the various parts. The speed of operation can be gaged from the fact that only three minutes are needed to cure and assemble the top of the desk with its supporting ribs. According to Mr. J. Leonard Michelson, director of sales and advertising of this corporation, the machine setup is capable of molding all of the various parts of the desk at one time.

The top is in reality a ribbed shell, supported in final assembly by a wood framework. Wooden strips are also used across the front of the two drawer wells as supports for the drawers. All these parts are assembled after the completion of the molding. It is a different story with the drawer cases and ribs, for the top of the desk, which are molded in.

A rather novel feature of these desks is the arrangement for the opening of the drawers. As can be seen from the accompanying illustration, there are no drawer pulls. Instead shallow curved sections are cut from the inside of the U-shaped side sections that hold the drawers. These leave enough room for fingers to grip the curved side of each drawer. The construction is plainly visible in our photograph of the desk.

Yet another line in which the firm is interested is spirally wound tubular plywood. This material was used extensively during the war for portable antenna masts.[1] Extensive tests are now being made on possible uses for the tubing in the textile industry where the properties of the material promise to add to the life and operating efficiency of a number of machine parts. To name but a few possible textile pieces, there are picker sticks, vat sticks, combing mill parts and bearing rings. The home accessory field is another outlet for this spiral wound material.

[1] "Resin-bonded plywood tubing," MODERN PLASTICS 21, 82 (Oct. 1943).

The cellulose acetate cab of this truck is made in two parts. Design calls for it to be split down the middle with an overlap on each half to facilitate assembly. Cabs are being produced of red, ivory and white cellulose acetate

Tomorrow's toy is engineered

Cooperation of manufacturer, designer and molder can mean improved product appearance, greater strength, lower costs, increased production speeds

Fins molded in underside of each half of the truck cab simplifies assembly. It is only necessary to fit these pins into the chassis and drive one nail through back of cab

PHOTO, COURTESY N. D. CASS CO.

THE N. D. Cass Company has been making wooden toys for many years. Its reputation in the field is good and its production efficiency is recognized. It was, therefore, somewhat of a surprise when the firm decided to use plastics in the production of its toy trucks. But it was no surprise that the decision proved most practical—so practical, in fact, that the company now plans to supplement the first molded toy truck cab with other plastic units.

There is a lesson for all potential users of plastics in the development of these toy plastic truck cabs to replace the former wooden units—a lesson of coordinated effort between end product manufacturer, designer and plastics molder.

Initial discussions with the molder, the American Insulator Corp. of New Freedom, Pa., began late in 1945 when Morris Sanders was commissioned to prepare a group of designs for consideration. Contact between all three parties went on from week to week and early in 1946 Sanders' designs were far enough advanced for study by the mold engineer and by the production management of Cass Company. Figuring that, in pull toys, a longer chassis would enhance the sales value of the toy, the designer shaped engine hood, front fenders and cab in such a way as to produce this effect. The job was streamlined, but it involved a few undercuts which promised to complicate the molding and had certain other features that made assembly

somewhat difficult. Already one production principle had been established: the elimination of bosses and the use of "monocoque" or shape strength to give the cab the desired engineering qualities. So well was this principle followed that a 240-lb. man can stand on the plastic part of the toy without breaking it.

The molding and the material

As the design was finally worked out to eliminate undercuts and simplify assembly, the cab is in two parts, split down the middle but overlapped so that the finished cab is completely clean after assembly. Toward the end of the summer of 1946, the first samples were drawn from the molds, which were then refinished.

Lumarith was the material selected for this toy truck cab because of its toughness, flexural and impact strength, and because there would be no jagged edges on which a child might be cut if by a very odd chance a cab was broken in use. The cellulose acetate is red for the dump truck; but pieces are being produced in ivory for a milk truck and in white for an ambulance.

Assembling the cab

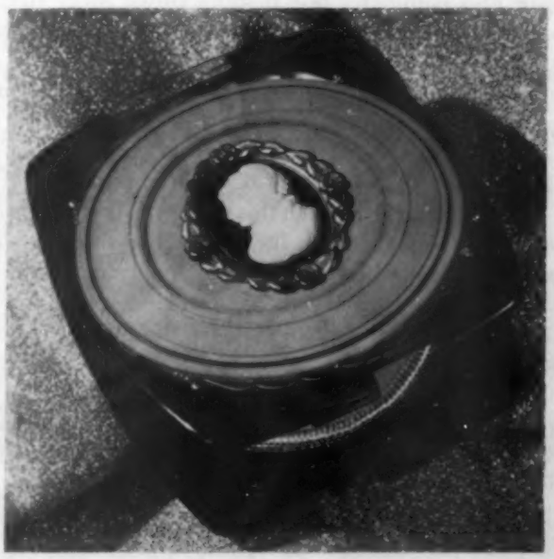
Since the design of the part and the engineering of the molds had been so carefully developed, actual molding did not represent much of a problem. A bevelled cut in the mold face produced the front window without the necessity of trim in degating. The cementing of the two halves of the cab with colored acetone did, however, present some difficulty since the halves are inclined to warp during handling.

For this cementing operation American Insulator Corp. developed a series of bonding jigs. The male, or overlapped half of the cab, is placed in a jig and the adhesive applied with a syringe. The other half is laid on to fit and a template lever brought down over the inside joint of the halves and locked in position until bond is achieved. One girl can handle a series of bonding jigs and the glue line is so clean, due to jig design, that there is no evidence of a bonding line on the outside surface of the finished product.

The method of attaching the cab unit to the chassis is unique in that it requires only one nail. Inside the front of the molded cab, behind the grille, are two slotted pins which fit easily into the simulated side rails of the chassis. Figure 2 shows the underside of the assembly with chassis in place. The supporting wood block coming up inside the rear of the cab is attached to the cab block with a small nail. The rest of the assembly all hangs on the wood side rails.

A HANDSOME GILT-FRAMED CAMEO sets the motif for an interesting acrylic compact being produced by Cruver Manufacturing Co. for General Specialties, Inc., both of Chicago, Ill.

Transparent Lucite or Plexiglas is used for the entire compact case. The lid and base sections are injection molded in a four-cavity die which produces two complete sets of components at each shot of the eight-oz. press. Inasmuch as these two halves must fit tightly when closed, so that powder cannot sift through, high standards of dimensional accuracy must be maintained during molding. This factor is also important since the interlocking catches, molded as integral parts of the upper and lower sections, must snap firmly together.

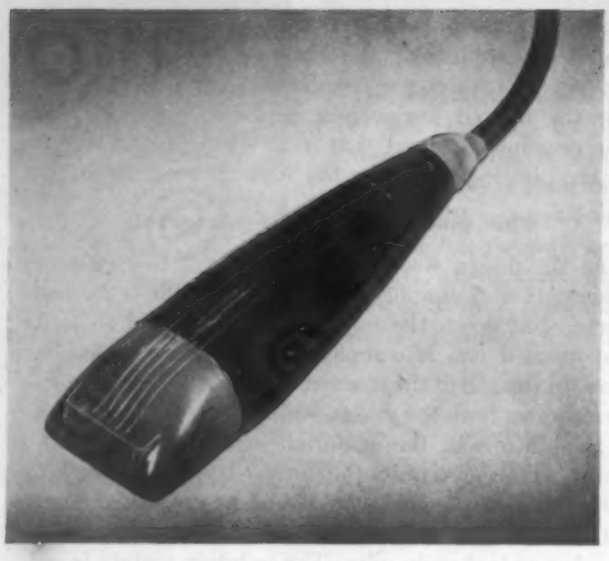


Creative Plastics, in designing the compact, has effectively used Cruver's Bas-Releef process. By this process, white, black, gold and supplementary colors are applied to the recessed design of the cameo, creating a three-dimensional appearance. The spraying is done by specially developed automatic equipment which turns out 1500 compacts per 8 hr. day although five sprayings are performed on the colored compacts and three on the black ones. Brown and dark brown, dubonnet and dark rose, cream and black are the combinations used for the inner circle and outer flange on the colored compacts.

It was originally intended to swag the mirror in position but variations in mirror diameters favored substitution of a cementing operation. In assembling the top and base sections, the components are placed in a jig in the closed position while hinge pin cores are drilled simultaneously from both sides, using air operated drills whose heads move in and out on horizontal ways. Metal hinge pins are then inserted.

Vacuum cleaners for home and car

The phenolics, the vinyls, cellulose acetate, cellulose acetate butyrate, and now polystyrene are being used in increasing amounts in all types of vacuum cleaners—in the more familiar home models and the new auto units



THROUGHOUT THE DEVELOPMENT OF VACuum cleaners the efforts of designer and manufacturer have been directed toward the creation of more efficient units that require a minimum of effort to operate, give a maximum of service and demand as little maintenance as possible. This explains why increasing amounts of plastics are to be found in the new home models and in the hand-sized vacuums for automobile interiors which are just coming out.

The light weight of plastic materials is of particular significance in this type of application, eliminating most of the physical strain from the operation of the unit. And because these materials can take involved shapes, yet maintain close tolerances, their use has permitted a certain freedom in design and the construction of more compact machines. With color inherent in the material, maintenance is reduced since scarring and chipping of a surface finish no longer applies. This all-through color also eliminates one manufacturing step, that of painting and rustproofing. Finally, the dielectric quality of plastics makes for safe operation.

Typical of the expanding market for vacuum cleaners and of the increasing use of plastics in this field is the Car-Vac, pictured above, which is being produced by the Development Engineering Co. of Pittsburgh, Pa.

All three plastic parts in this unit—the body, nose and tail piece—are injection molded of polystyrene. The body is produced in a two-cavity mold; nose and tail pieces in a four-cavity mold. Molding cycle for the body is approximately 45 sec., for the other two parts about 35 seconds.

Aside from the usual finishing operations, there are a number of jobs that must be done on the plastic parts before assembly. There is a simultaneous two-hole drilling operation for hinge pins, the lapping of the tail valve surface on the body to effect a suitable seat for the rotatable tail, regulation of the tension of the tail valve anchor screw, testing of the manometer for leakage and cementing of check valve to the head.

A SMALL SIZE AND great wear must combine in the new automobile vacuum cleaners, like this Vacu-Mite of Craft Industries, Inc., of Buffalo, N. Y., if they are to be of any real value. They must tuck away in such small space as a glove compartment and take the jouncing and jarring of a moving car.

To meet these requirements this car cleaner was designed to be made almost entirely of plastics—Tenite II, to be specific. The hose-attaching nipple, hose splice fitting, body, suction head and interior ring for fastening the cloth bag in position are all molded of this material by Quinn-Berry Corp. of Erie, Pa. In fact, the only non-plastic pieces in the unit are the washer for installation of the control valve, the alloy spring which keeps tension on the gate in the control valve, the rubber washer which provides a positive vacuum seal between the nozzle and barrel, the cloth dust bag and the rubber hose running to windshield wiper.

Upon completion of the molding of the plastic parts the valve and the housing of the unit are assembled. The dust bag is then permanently bonded to the cellulose acetate butyrate bag ring with acetone and the rubber washer installed. The trademark on the face of the vacuum nozzle is then finished by spraying a contrasting color paint into the molded-in lettering. Finally the filter, which consists of two plastic grids that compress an 0.050-in. matt disk of furfural impregnated Fiberglas, is pressed into base of barrel. To operate, hose is attached to windshield wiper.

REDUCED COSTS AS WELL AS IMPROVED OPeration and lighter weight account for the Regina Corp.'s, Rahway, N. J., increased use of plastics in its Electrikbroom home cleaner. Tests were conducted to determine the materials best suited to each individual part, with the result that plastics were selected for five different applications.

The nozzle wheels, placed at both ends of the cleaning nozzle, were formerly made of rubber, molded around a brass bearing insert. By using Lumarith for these wheels a saving in labor and materials was effected and a better product turned out. Cellulose acetate was found to wear well in this application, thus eliminating the need for replacements.

A removable Lumarith Staticomb is held in the nozzle between the two molded wheels. This part was added to the vacuum cleaner because of its unusual ability to magnetize and to pick up all of the smaller threads and hairs. A combination of static attraction and physical tooth engagement in this comb assures that these particles are picked up; the teeth which part the carpet nap afford deeper cleaning. Like the other cellulose acetate parts, the comb is red in color.

Cellulose acetate is also used for the handle wheel and the locking cam handle. The former part is used when attachments are employed and the Electrikbroom is dropped to a horizontal position. Wheels then form a three-point roller contact with the floor. The cam-handle is used in locking and unlocking the dirt receiving cup. Cup is compression molded of black Durez.

COLOR PLATE, COURTESY THE HOUSE OF LACKNER

1—A mahogany case and dial face of methyl methacrylate give this clock its modern look. Light-piping qualities of the material are used to advantage at night

New beauty in clocks through plastics

The acrylics, ethyl cellulose, the phenolics and polystyrene are among the plastics that lend style to today's fine clocks

A FAR cry from Grandma's statue of Eros holding aloft a gilded clock and from Mother's rococo marble mantle clock, are the magnificent time-tellers offered this year in every price range. The new clocks are simple, beautiful, colorful and durable. The reason: various uses of different plastics materials.

In every category, from alarm clocks through kitchen wall units to elegant pieces for livingroom use, the trend in the design of clocks is toward their use as room appointments. The increasing use of electric movements has added other possibilities, including delicate chimes, direct reading faces, radio alarms, lighted dials.

The House of Lackner, Cincinnati, Ohio, using to best advantage the light-piping qualities, the formability and the easy engraving characteristics of Lucite, has produced a new lighted-dial clock in the best modern manner (Fig. 1). The case, of bleached mahogany, has a narrow profile. On it are mounted only the hands. The dial face is engraved on the back of the acrylic sheet which curves across the front of the mahogany case to enter it at both sides. Thus, the acrylic is at one and the same time the front structural member of this clock and the real time teller. A concealed fluorescent neon tube effectively edge-lights the face and creates time-telling qualities day and night.

The Semca Clock Company, Inc., New York City, is another company that makes novel use of acrylic materials, fabricating the clear or colored Lucite into a variety of cases to hold eight-day, seven-jewel movement (Fig. 3). Chief design features lie in the com-

2—An injection molded case of ethyl cellulose highlights handy wall clock with slanting numbers for easy reading

PHOTO, COURTESY HERCULES POWDER CO.

pany's appreciation of the relationship of planes to acrylic area as a means of enhancing the three-dimensional effect and in the firm's use of plated bolts and nuts for assembly. Placed where light strikes them, these clocks stand out effectively.

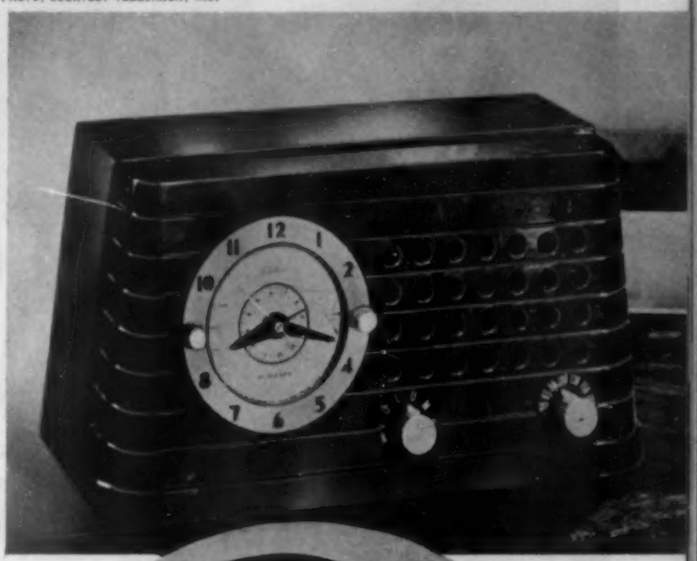
But the acrylics are not the only plastic materials finding favor with today's clockmakers. Injection molded Celcon in three colors—red, green and ivory—forms the case for a direct reading numeral wall clock manufactured by the Pennwood Numechron Company of Pittsburgh, Pa. With the clock placed on the wall, the time can be told at a glance. The hour, minutes and seconds are shown by numbers slanted to make easier reading when the observer is looking up. Molded Insulation Co. of Philadelphia, Pa., producer of the case, used ethyl cellulose because of its toughness, color qualities and dimensional stability (Fig. 2).

Musalarm for Telechron Inc., Ashland, Mass., tomorrow's alarm clock, depends on yet another plastic—phenolic—for its housing. On going to bed at night, the user sets a radio dial to the station desired and turns on a volume knob. In the morning, instead of a bomb, a buzz or a rude ring, he is wakened by his favorite morning musical program. The mahogany phenolic case is molded by the Plastics Division, General Electric Company, Taunton, Mass (Fig. 4).

The Magna electric clock, produced by Magna Products Co., San Jose, Calif., is styled for them of Lustron. Dimensional stability, color and high gloss were the reasons for the selection of polystyrene for this clock, the molding being done by Remler Co. Ltd. of San Francisco, Calif. The clock has an ingenious hood on the back which permits it to sit in 3 different positions. It rests easily in the conventional position; the clock can be positioned so that it is easily viewed from above when placed on a low table; or it can be so placed as to be readily seen from below if placed on a high shelf. The lens section of the case, which is molded in one piece, is painted black on the outside edge, only the part directly over the dial being left clear. The body of the clock case is molded in two sections in various attractive colors—red, green, ivory and black predominating to date. The back section serves as a cover to mask the setting key so that the clock is just as beautiful from the back as it is from the front or side. Each clock case has a Flamenol cord and plug furnished by General Electric Company (Fig. 5).

4—Music wakes the sleeper with this radio-clock combination housed in phenolic. "Alarm" is set before retiring

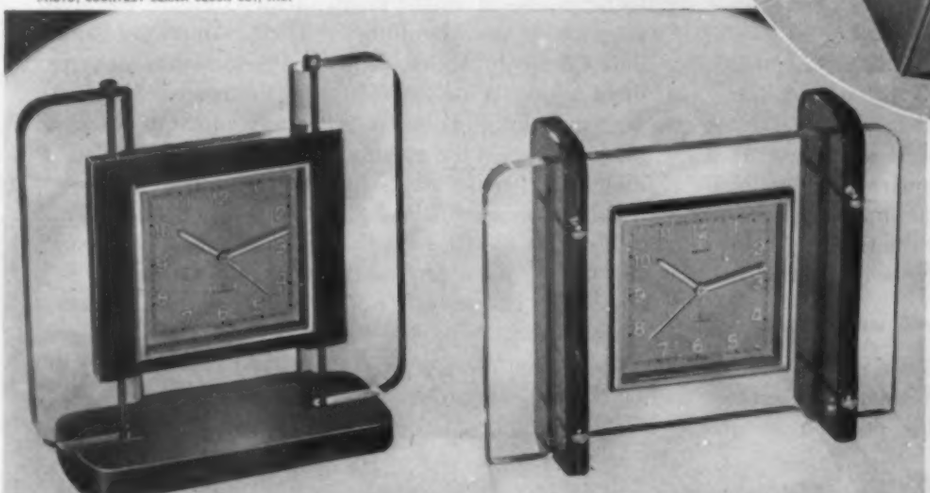
PHOTO, COURTESY TELECHRON, INC.



PHOTO, COURTESY MONSANTO CHEMICAL CO.

3—Methyl methacrylate is again used to make handsome clocks below. Plastic enhances three-dimensional effect

PHOTO, COURTESY SEMCA CLOCK CO., INC.



5—The styrene encased clock (above) has hood which permits it to be set in three different positions

A new use for Deep Drawn laminates

PHOTO, COURTESY BAKELITE CORP.

1—Realistic to the last detail, this sloop is rigged for action just as a real one would be. Construction of boat emphasizes new molding techniques and materials which not only help to make it sturdy but less expensive than most hobby craft

VISIT the pond in any city park on a sunny summer Saturday or Sunday and you'll see grown men by the scores sailing "toy boats," while small boys (big boys, too) watch with wondrous envy.

The models you'll see are not toy boats. They are racing yachts, schooners and sloops in miniature, perfect sailing machines in every detail and responsive to good seasmanship in racing one another. And the reason the youngsters up to now have had to watch such magnificent models rather than own them are two: first, because for all their perfection, such ships have been too delicate for the touch of inexperienced hands; second, because they ranged in price from $75 to $250.

Now, thanks to John Currier and the Noma Electric Corp., New York City, boys of all ages can have for about $30 a model racing sloop that would cost $100 made by conventional methods and of conventional materials. Mr. Currier has for years made a hobby of model yacht building; his boat is the result of his experience with his hobby and knowledge of plastics.

New materials, new process, new molds

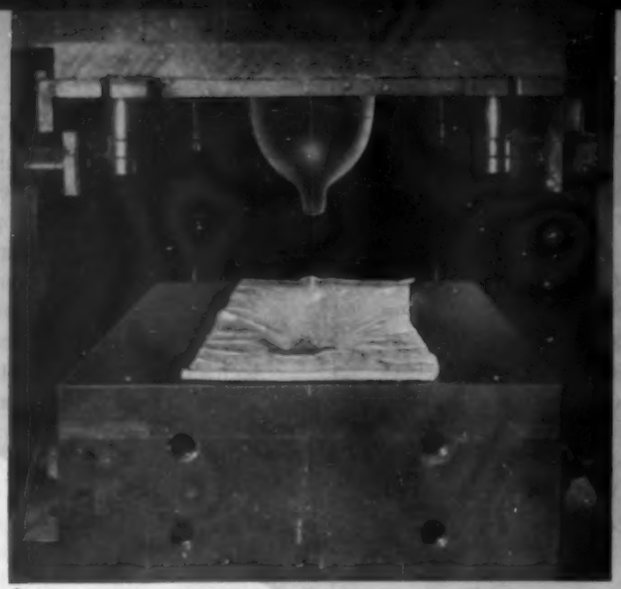
The yacht is produced with the use of three rather new plastic materials—polyester resins, vinyl acetate adhesive and resorcinol glue—plus polystyrene and rigid vinyl sheeting. Its construction highlights several new techniques.

The hull, which is low-pressure molded from a polyester resin impregnated special type of cotton cloth, is manufactured by Andover Kent Aviation Corp., New Brunswick, N. J., in cast iron alloy molds. The hull could have been compression molded, but greater impact strength was obtained by this method.[1]

The molds used in the forming of the hulls are precision castings in alloy iron. They are among the first to be produced as the result of an extensive research program in the Metallurgical Dept., American Brake Shoe Company, Mahwah, N. J. Production of this type mold is now being carried on by the company's Engineered Castings Division. The advantage of the cast alloy method of die making is that it permits the use of male and female molds for short run jobs, the total mold cost being 1/3 below that of tooled steel dies.

For this model boat hull, engineers used an exact prototype of the product (a set of blue prints will do) similar to that used for a tool steel mold. Working from the prototype, the engineers calculated shrinkage in both their alloy mold material and in the plastics to be molded. With this information the precision cast-

[1] "Deep drawn laminates," MODERN PLASTICS, 23, 100–102 (March 1946).



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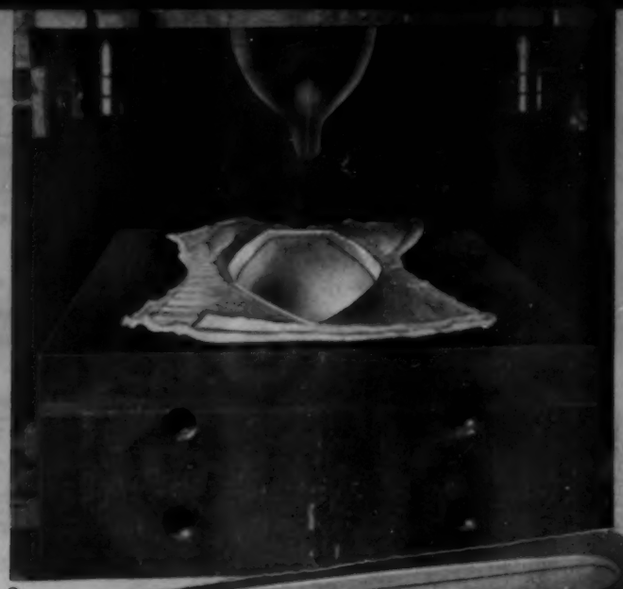

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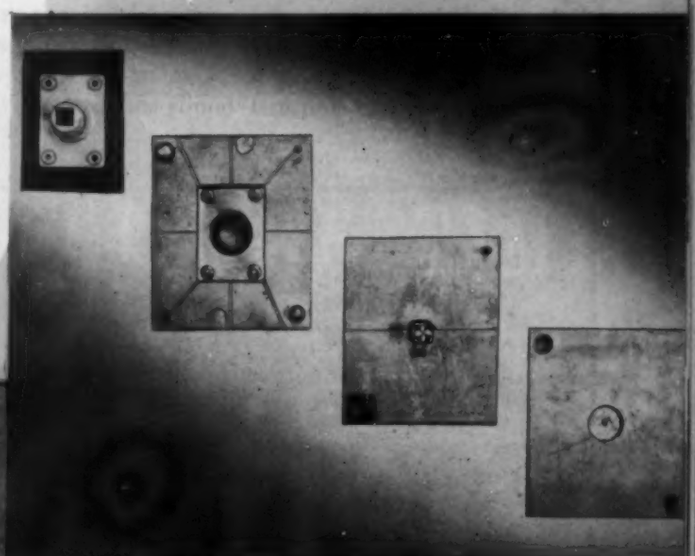
4

ing setup was made and the molds were cast in an alloy best adapted to required strength and surface quality. The cast molds were shipped to Columbia Engineering, Inc., Newark, N. J., and polished—10/1000 in. polishing stock having been allowed on all critical surfaces. Molds of this type can be supplied in a heat treated condition to insure easy machining, after which they can be hardened to the necessary Rockwell hardness. For low-pressure work it is possible to order the molds made of machineable materials sufficiently hard as to cast to eliminate any heat treatment.

The molding method is technically known as deep drawn laminating. It provides deep draws with very thin and equal sections to close tolerances and with sharp corners. High pressures of 1000 p.s.i. are used to make male force plugs draw and form the knit fabrics which are stretched over female dies; heat is used to cure resins impregnating fabric. (*Please turn to next page*)

2—The cotton cloth for the forming of the hull is impregnated with polyester resins and laid in the mold with a sag to prevent stretch during the molding process. 3—The hull in the mold after low-pressure lamination is completed; and 4—Hull as it appears when removed from mold



PHOTOS 1-6, COURTESY NOMA ELECTRIC CORP.

5—Brass molds used in the making of the mast step and (left top) finished aluminum-painted polystyrene piece

6—The hull-deck assembly, after emerging from glue cure chamber, is tested for waterproofness of glue line

Figure 2 shows the special type cotton cloth laid on top of the mold; Fig. 3 shows the finished molding in the cavity, with the force plug or male die visible at the top. The precision cast male die was produced from an impression taken from the polished cavity utilizing special materials which compensated for alloy and plastics shrinkage and permitted the finishing of the plunger with a light machining cut. In this way, uniform thickness of the plastic piece was insured. Referring to Fig. 4, it will be noticed that some horizontal flash is left on the molded hull for ease of handling in deck assembly.

The special significance of this model boat, which is not a mass market product, lies in the following facts:

1. The second article to be made by the deep-drawn laminate process—the first being an ice bucket—it indicates the possibilities of this method for such things as housings for scales, salesmen's sample cases, desk trays, large size reusable packages.

2. Production features processing of a stretchable fabric and a polyester resin under high pressure in matching dies made of precision cast iron alloy.

The assembling and finishing is the work of the Jersey Plastics and Die Casting Company, Newark, N. J. To the 4½ oz. polyester hull is glued a 1¾ lb. zinc die cast keel. Vinyl Seal MA 28-14 is used, further strengthened by two self-tapping screws and washers. The decks, made from aircraft birch plywood and pre-assembled with three small deck beams, have to fit perfectly to be water tight. The hull is put into a gluing jig, the horizontal flash supporting it at the top, and Bakelite's BC 17613 cold-setting resorcinol glue is applied through a syringe. Then the deck is snapped into place, and the hull in its jig is placed in a simple heating oven. In oven, four infrared lamps supply heat to three bays for jigs, a wood shape exerting uniform pressure under metal weights on the top of the decks. The resorcinol glue sets in about 15 min. and is then given a thumbnail test to insure that the yachts will be completely waterproof and durable when awash in a race.

After the hull and deck are assembled, the sloops are trimmed of flash and painted white topside with red below the water line. The lacquers are specially compounded for adhesion to polyester resin base by the Clover Leaf Paint and Varnish Corp. of Long Island City, N. Y.

Figure 5 illustrates a further piece of pioneering in this job—the use of inexpensive brass molds for short-run injection work on polystyrene. In this case it is a mold for the mast step. This molding is done on one-oz. Watson-Stillman laboratory type of press.

A small strip of rigid Vinylite is used as a batten at the head of the mainsail, being pushed into a sewn space in the sail.

As mentioned above, this yacht is not a toy; neither is it a construction kit. "Set the mast—she's set to sail"! is the merchandising slogan selected by Noma Electric Corporation. With an overall length of 28 in., a waterline length of 19 in., a 5 in. beam, 7 in. draft, 36 in. mast and 18 in. boom, yacht weighs three pounds.

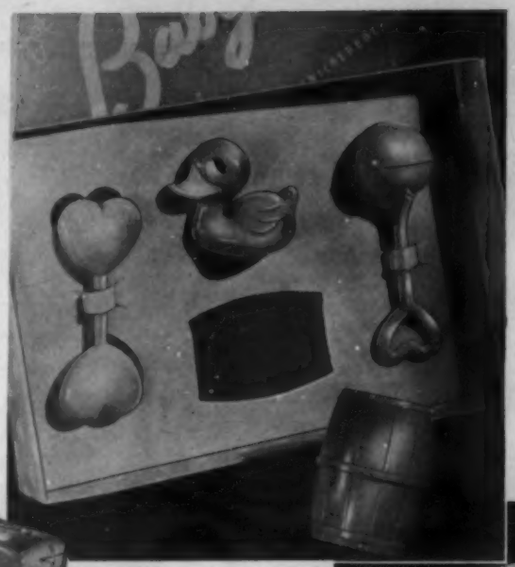
A FULL HOUSE OF POKER PLAYERS can be accommodated at this poker table, fitted around the outside edge with eight plastic trays.

The trays are molded of black Bakelite by Modern Plastics Corp. of Benton Harbor, Mich., for Durham Mfg. Corp., manufacturer and distributor of the table. A high pressure compression molding technique is used and, because the trays are made in chrome-plated dies, finishing operations are unnecessary. Eight of the semi-circular shaped trays, each having a well for poker chips and a well for a glass, fit compactly into a trough that circles the table.

Spilling of drinks is not a feared calamity with this table since glasses are sunk to sufficient depth to prevent tipping. In case of accident, alcohol will not harm the finish of the trays. Nor will scraping of poker chips damage them.

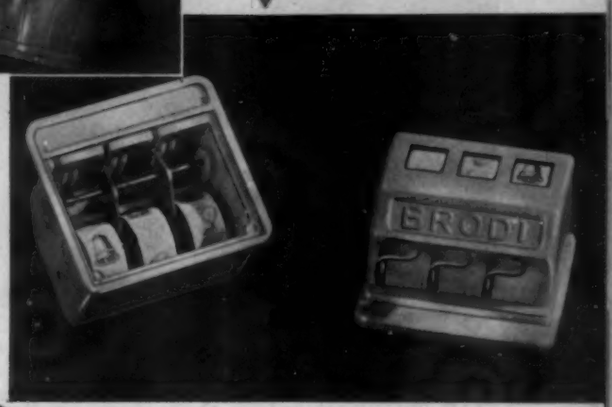
PLASTICS PRODUCTS

Addresses of firms mentioned on these pages are listed on page 216



Toys for the tiny tots include two rattles, a duck and a floating barrel. Set, injection molded of Lumarith and Tenite by the Knickerbocker Plastic Co., is packaged by Robert Gair Co., Inc., and comes in pink or blue

The Brodi game hits the jackpot in entertainment! The housing of the toy, which is available in several colors, is molded of Beetle or Plaskon by Kuhn & Jacob Molding & Tool Co. for Devalera Mfrs. Metal mechanism is held in the housing by metal pins



LEISURE-TIME PLASTICS

Fun, playing gentleman farmer with International Harvester's "Farmall" toy tractors! They are built to 1/16 in. scale of the real thing, made in red Tenite by Product Miniature Co.

For lazy readers—a Book reader that holds a book at any angle. Its 4 plastic parts are molded of Celcon by Arnold Brilhart, Ltd. Ross-Frederick Corp. is the distributor

BUSINESS

Seven times lighter than an iron jointer, this polystyrene jointer for finishing off cement between brick and tile, comes in a variety of thicknesses, colors and lengths. Unlike iron, it leaves no dark discoloration on cement. Made by the Plax Corp. for George A. Fuller Co. Rod end becomes smoother with use

To facilitate inquiries, the full addresses of the companies which are mentioned on these pages are listed on page 216

A unique desk accessory combining a compact perpetual calendar and memo sheet receptacle is molded by Jameson Co. for the Continental Mfg. Co. It is available in black, walnut and ivory Tenite II

Declaring war on that uncertain quantity, United-Rexall Drug Co. will distribute clear polystyrene measuring spoons of 4 cc. capacity with all liquid prescriptions. Los Angeles Button Molds & Die Mfg. Co. does molding

and INDUSTRY

This display piece is made to facilitate the matching of false teeth to genuine ones. Various shades of plastic strips are mounted on pink Tenite II base molded by G. Felsenthal & Sons, Inc., for H. D. Justi & Son, Inc.

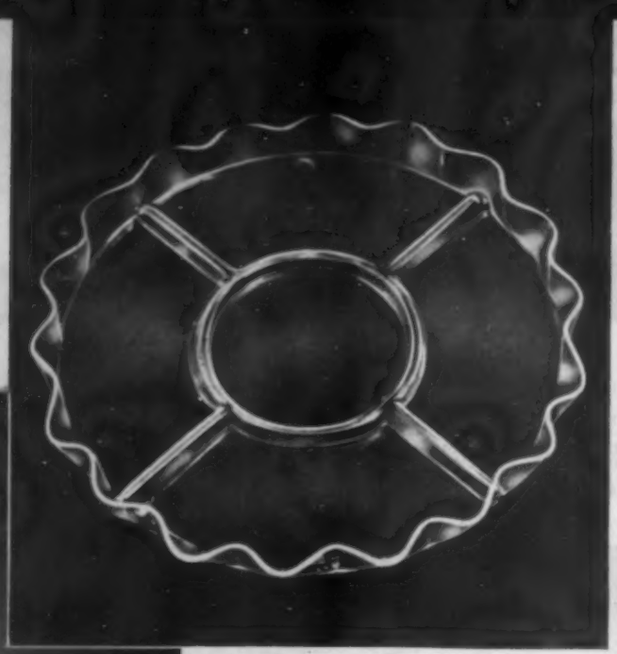
Reliable insulation, impact strength, oil and grease resistance are provided in tools by combining Geon and Hycar OR rubber. Connecticut Hard Rubber Co. makes these Cohardite handles

As a "high sign" to travelers, Eastern Air Lines installed 4-piece Lucite display units. Each display has 12 full-color drawings, silk screened on methyl methacrylate sheets. Printing is on another sheet that fits in holding groove in base. Victor M. Clark Co. is the fabricator

Able to compute its own angles from bearings, the Plotractor, fabricated of Nitron by the Cardinell Corp., simplifies work of engineers, surveyors and navigators

TIME marches on at a faster pace now that overseas pages are proofed on 0.0012-in. Lumarith film and airmailed to printers for use on sensitized zinc plates as positives

Home Decoration



An invitation to the sampler and connoisseur is this decoratively fluted Lucite tray formed by Almac Plastics, Inc. Its clear, brilliant colors and roomy compartments will also appeal to most any hostess' practicality

Doing a good churn for the farmer's wife, this electric Gem Dandy makes butter in 15 minutes. The shockproof Durez handles, mounted on motor, are molded by Harry Davies Molding Co. for Alabama Mfg. Co., manufacturer

Adjustable to five positions, the Leisurest couch can be employed at home, in dormitories and in offices. It is upholstered in Koroseal or Duran by Imperial Leather Furniture Co. and distributed by Kalmus-Golden, Inc.

No need to dig through shells for nutmeats with this divided nut bowl of Resinox. One half takes care of the shells and the other the shelled nutmeats. Accompanying the bowl is an aluminum alloy nutcracker which rests, when not in use, in a special cradle recess in the center of the bowl. Both the nutcracker and the bowl are Lin-Line Products sold by the L. A. Lininger Co. The bowl is molded by the Automatic Plastic Molding Co.

A woven plastic fabric which breathes is used on this furniture. Made in solid yellow and solid blue for this application, the Lumite material is said to have a texture that provides the same comfort as any other woven fabric and has the additional qualities of being stainproof, resistant to wear, cupping and fading. The plastic film is resistant to cleaning fluids and can be cleaned with a damp cloth if this is more desirable

Addresses of companies mentioned on these Plastics Products pages are given on page 216 to facilitate inquiries

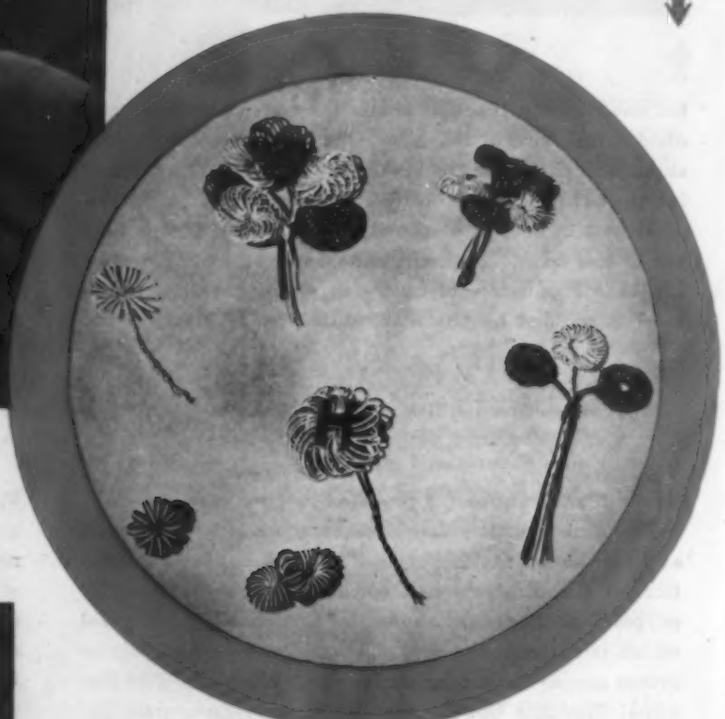
You can grind pepper as you need it—and keep salt flowing regardless of the dampness in the air with this salt and pepper set molded of Lustron. A modern adaptation of the old-fashioned spice mill, the unassembled pepper shaker at right shows the tiny metal grind wheel which is beneath the cap. This separates caked salt or brings pepper down to granular size. It is molded by National Products Co. for the Engineering Enterprise Co.

Vinyl combined with soft cotton felt forms this Revtex quilted bed pad which is waterproof, stainproof, rot-resisting, sanitary, resiliently soft. Pad, a product of Revere Mfg. Co., is said to outlast cotton as no laundering is required. It can be quickly cleaned with a damp cloth. Nylon thread is used to stitch vinyl binding around pad. Two sizes are avialable: 36 by 74 in. for single beds and 54 by 74 in. for double beds

Women's

For subtle harmony with new winter-spring fashions, this smart Plexiglas and gold lapel pin strikes a note of sparkle for town or travel wear. Designed by the Elzac Co., the penguin's lustrous black body contrasts sharply with the gold

A new member of the Plexon family is "Pigtail," a wire coated with synthetic yarn. Coming in many colors, it can be used to make costume jewelry, millinery trims or corsage bindings



Reflecting the light delicacy of the perfume it encases, this white and gold box is fabricated of Plexiglas by Progressive Plastics Mfg. Co. Bottle top and base are molded of polyethylene by Shulton, Inc., and silk screened

Top, bottom and sides of this hat box are all made of Velon. Fabric-covered stays that hold box upright may be folded to collapse the box

The addresses of companies which are mentioned on these eight pages are listed, page 216

Accessories

Daytime, playtime shoes, when made of Cogon, a plastic webbing woven by Concordia-Gallia Corp. of Saran monofilaments, are easily cleaned, are stain resistant and colorful

For display and for protection of a cherished watch. Fisher Plastics Corp. molds this Lumarith case for Kent Box Co., Inc.

MEN'S ACCESSORIES

Chances are good on a Bakelite roulette wheel compression molded by Jersey Plastic & Die Casting Co. for Fairfield Co. Phenolic ring and base are assembled by self-tapping screws. Markings are decalcomanias

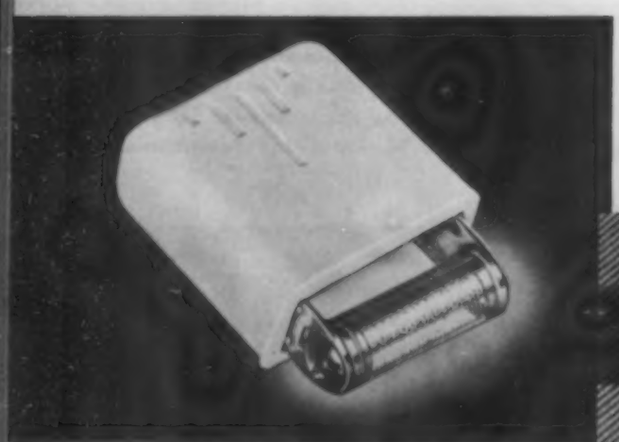
Juggling jiggers is avoided by the use of a 1-oz. Akret measurer which rests on glasses to eliminate spilled liquor and stained furniture. It is molded in one piece in a 4-cavity die of crystal-clear and durable polystyrene by Wolf-Schrager Corp. for Akret Products, Inc.

A traveler's aid that can be used when journeying by air, rail or car, is this suit cover bag made of combined Fiberglas cloth and Vinylite with nylon stitching. The plastic material, called Glastron, is made into these bags by Phil-Mar Products Co. The bag calls for a minimum of folding and protects suits from dust

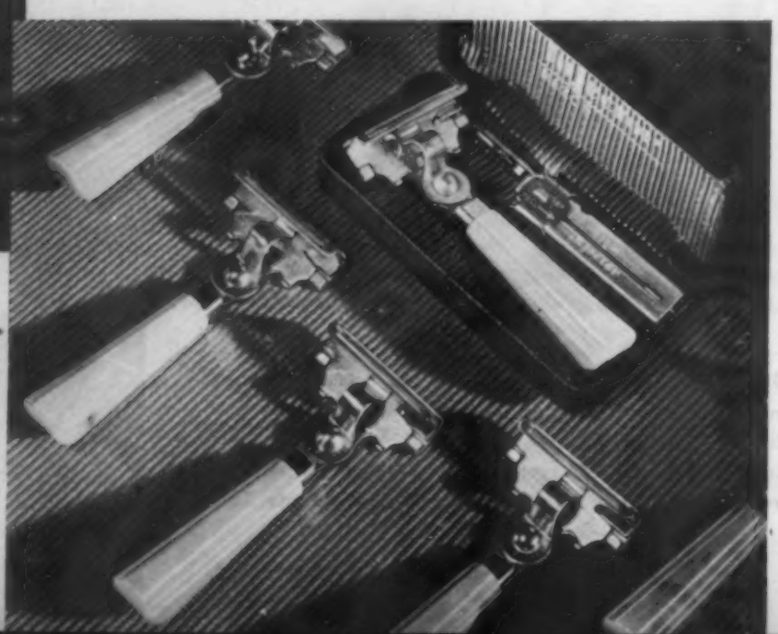
A topper for rainy days. This vinyl shell, made by Rubber Corp. of America for Adam Hat Stores, Inc., is called a "Hat Brella." The film's elasticity renders it stretchable and easily fitted to the form of a man's hat. When removed, it can be stuffed into an overcoat pocket ready for use on the next rainy day

Addresses of the companies mentioned on these Plastics Products pages are listed on page 216

MEN'S ACCESSORIES



Of match folder size, the Vestpox dry shaver can be used anywhere anytime. The polystyrene case is injection molded by the F. J. Kirk Molding Co. and compression molded by Northern Industrial Chemical Co. for Ward Machine Co., Inc.



A handle of Chemaco ethyl cellulose is now being used on the Schick injector razor. Material was selected for its resistance to cracking and its dimensional stability. Mack Molding Co. does molding of this attractive part

S.P.E. annual technical meeting reports

These four pages contain abstracts of the speeches presented at the annual meeting of the Society of Plastics Engineers held at the Hotel Congress in Chicago on January 27 through 31. The speeches by W. H. Aiken on specialty resins, by S. K. Moxness and J. Formo on live steam preheating, and by R. J. Metzler on thermoplastic laminates, are covered in full elsewhere in this issue as noted later in this report. The article by T. N. Willcox on dielectric preheating will be published in full in the March issue of this magazine together with a report on the S.P.E. Plastics Exhibit.

Cast phenolic resins: *by W. R. Thompson,* Catalin Corp.—In the manufacture of cast resins, specific conditions must be fulfilled in obtaining a true hydrophilic product. These include:

1. Relatively high formaldehyde ratio.
2. Relatively high proportion of fixed alkaline catalyst.
3. Proper balance of time and temperature to produce a liquid resin which does not separate at any stage in the process.
4. Use of organic acids for neutralizing and acidifying the alkaline product to give sodium or potassium salts which are very soluble in final polymerized resin.
5. Hardening takes place on the acid side at atmospheric pressure at a temperature below the boiling point of water.

Cast resins are unique in that they contain no filler. The conversion from the liquid to the solid form takes place in open molds at a temperature of about 80° C. for periods ranging from three to eight days, depending upon type—opaque, translucent or transparent.

In the manufacture of these products, the initial condensation reaction (phenol-formaldehyde and caustic) is preferably done at about 70° C. at atmospheric pressure for 2 to $2^1/_2$ hours.

In parallel with other branches of the plastics industry, the demand for more complicated designs has greatly expanded the application of cast resins processed by all the different methods.

In the evaluation of this product, colorability is certainly one of the outstanding properties. And since expensive molds are unnecessary, there is a resultant saving to the customer in preparation time and money.

Coatings: *by E. H. Bucy,* Zapon Div., Atlas Powder Co.; read by *Harris G. Beck, Jr.,* Technical Director, Zapon Div.—Probably the largest single chemical development in the protective coating field in the last 50 years, has been the increased use of alkyd resins. Then there are the cellulose esters such as nitrocellulose and cellulose acetate which have a wide variety of uses in this field. These plastic base coatings entered production for a large number of uses with the development of lower viscosity nitrocellulose and availability of large quantities of butyl alcohol and butyl acetate. Ethyl cellulose, a cellulose ether, is finding its greatest usage in a non-greening bronze powder application, insulating coating for wire and cable, and paper coating for dehydrated and frozen foods.

There is an increasing use of various acrylic resins in protective coatings. It has been found, for example, that even a thin acrylic coating properly made, may conduct light in the same manner that acrylic plastic shapes do. Melamine and urea formaldehyde resins are finding their greatest usage when combined with selected alkyds for high-speed production finishing lines.

Various modified phenolic resins have been introduced into many production finish formulations where corrosion resistance is necessary. Such protective coatings do not have maximum color retention and cannot be used for making white finishes. While the silicone resins are still very high in price, their extreme heat resistance makes them desirable for finishing chemical equipment and smoke stacks.

The vinyl chloride, high molecular weight vinyl resins, find their biggest coating use for calender application to fabrics. High quality upholstery for home, bus and airplane is being produced currently with these resins. Co-polymers of vinyl chloride and vinyl acetate of somewhat lower molecular weight are used widely in industrial finishes and in the packaging of food.

Molding television lens: *by R. V. Beshgetoor,* Radio Corp. of America, RCA Victor Div.—Metal, not glass molds, have been found necessary in the molding of true optical lenses which, when combined with spherical mirrors, form the Schmidt system of reflective optics as adapted by RCA for use in projection-type television receivers. But before metal molds could be produced it was necessary to design and build a high precision mold measuring device which would measure the curvature of the mold surface accurately and quickly to within $^1/_{100,000}$ inch. It was then necessary to design and build a precision mold-making machine.

The metal surface for these cavities was first prepared by rough grinding to within 0.001 of an inch of the final contour. They were then placed on the mold-making machine and rough ground by diamond wheels to the final contour. Then they were fine ground in various steps, also by means of diamond wheels, and ultimately polished by an assortment of special cloverleaf and swastika shaped polishing buttons. It was necessary to carefully and periodically check the mold curvature by means of the mold analyzer.

It was found that a semi-positive compression mold was the most satisfactory type for lens production. All lenses produced by the conventional injection procedure either had internal strains or did not have as satisfactory optical resolution as those produced by compression. Since careful inspection of the mold surfaces is required after each step, the company designed and is now using a tilting head type of press.

Another molding machine now being used for this work makes use of a self-contained injection unit coupled to a tilting head press. In effect, the molding is actually done by compression at about 3000 p.s.i. and the platens are alternately heated by steam and cooled by water. However, the charging of the mold is done by injection.

When a controlled charge has been deposited in the semi-positive mold, the flow is shut off by an automatic device and the compression ram is actuated. This forces lower half of the half of the mold up against the force plug and molds the lens by compression.

Advantages of this type of molding are said to be: a) less handling of material; b) each charge is controlled accurately and is preplasticized and homogenized as it enters the mold; c) no excessively strong clamping force is required which might increase the difficulty of maintaining mold alignment; d) use of comparatively low injection pressures; e) possibility of gating at any point in the mold with no resultant strains being set up in the molded part.

Physical properties of resin gypsum castings: *by John Delmonte,* Plastics Industries Technical Institute—Admixtures of plastics materials with gypsum cements make available new materials of construction which offer improvements in properties over straight gypsum products, and at the same time a greater latitude in controlling the casting and fabricating properties of gypsum. A number of combinations of gypsum plasters with water soluble resins and also with cellulose derivatives have been

studied in order to determine their peculiar characteristics.

In practically all cases the presence of plastic material retarded the setting time of the plaster. In particular, melamine-formaldehyde, sodium carboxymethyl cellulose and phenol formaldehyde slowed down the setting time. Hydroxyethyl-cellulose showed some unusual characteristics by greatly increasing the degree of expansion of the gypsum plasters.

Polyvinyl alcohol increased the physical properties of No. 1 pottery plasters, though pure alpha gypsums fell off slightly in characteristics. High viscosity methylcellulose, as compared with low viscosity methylcellulose, effected less expansion. The urea and melamine-formaldehyde resins were particularly notable for increase in physical properties their presence imparted.

Modernizing low-pressure laminating: *by W. I. Beach,* Behalbry Plastics Corp.—Low-pressure molders, cognizant of the limitations associated with existing practices of laminating by the vacuum bag-oven-curing procedure, are invariably turning to more productive methods of manufacture.

Using matched dies, speed and ease of production depend on type of resin employed. In the wet or catalyzed class of resin, impregnated fabrics are cut to pattern and assembled in the female mold or on the plunger—whichever is the stationary member. Pressure required to obtain a uniform laminated part may vary from 15 to 100 p.s.i. Curing temperature is provided by electrical heating elements or steam jackets in stationary mold.

When condensation type resins are used, the material in the dry impregnated form is shaped to a preform, which is placed in the cavity and molded in the same manner as cited above. Unless the part requires a split mold, the complete molding cycle is about 65 percent faster than the hand lay-up vacuum bag method.

Another recently developed method involves drawing or deforming the part to shape from flat material. The mold differs from the other type of mold mainly in construction of the plunger, which is either solid rubber or metal backed with a shield.

For certain types of work the resin injection pressure chamber form of molding is preferred. Here a core is covered with dry or partially impregnated fabric and clamped in place; over the core goes a pressure vessel fastened to the flange at the bottom of the core. The required percentage of resin is injected under pressure into the chamber. For curing temperature the assembly may be placed in an oven or wired for electrical heat; high frequency heating is another possibility.

One of the techniques now in the experimental stage possessing great potentialities is the felted preform method, in which fibers saturated with powdered resin are blown on a screen form. Through control of the amount of fibers in suspension a uniform layer is deposited. When dried, the preform is ready for molding by any of the previously cited methods. This process offers possibilities for reducing material and production costs.

Liquid phenolic casting resin: *by C. R. Simmons,* Durez Plastics & Chemicals, Inc.—Accelerated-type liquid phenolic casting resins have, during the past few years, been greatly utilized as forming dies for hydro-press and stretch-press operation, as assembly jigs and fixtures, as design and working models, and plating sheets. In processing this material resin, accelerator and filler—if used—must be carefully weighed before mixing. They are mixed slowly to avoid bubbles, then allowed to remain in container 10 to 15 min. to permit air bubbles to rise to the surface.

The mixture of resin and accelerator must be poured soon after mixing, 15 to 30 min. being the usual practice. Curing cycle depends on volume of resin, amount of catalyst, and thickness and heat transfer characteristics of the mold. Temperatures higher than 138 to 142° F. may cause foaming of resin. The piece must be completely cured and hard before removal from oven.

Fillers may be added but generally lower strength of cured plastic. Though plaster molds are most widely used, wood, metal, rubber or plastic molds may be preferred for some jobs. Lead molds are definitely best for production runs.

Production fabrication of polyester resins: *by S. M. Shobert,* Motor Tool Mfg. Co.—Thermosetting ester type resins cure by polymerization rather than condensation. No gases are evolved during the curing of these resins and pressure is not required to effect a satisfactory cure. Means of curing these resins now under consideration include ultra violet activation of a catalyst which initiates the polymerization, requiring no heat.

First approach and oldest method of processing low-pressure runs was the vacuum bag technique. Next approach is called rubber diaphragm molding.

Another approach is called the rubber punch molding technique, involving a female mold and a solid rubber male mold. Conventional male and female dies such as those used in high-pressure phenolic molding may be employed.

One of the most novel approaches to real production in this field is a direct carry over from injection molding. It involves die cutting of the cloth and placing it in an injection press. Once the molds are closed the resin is injected into the dry base material. Flowing into the cloth, the resin displaces the air and produces a very satisfactory laminated part. This process has the advantage of standardization of the item fabricated and rejects are quite low. Cures by this process depend on size of the fabricated parts; pieces $^1/_{16}$ in. thick have been cured in from 30 to 60 seconds.

Then there is the method of continuous production of flat laminated sheets on a flat sheet machine.

Limitations in this field include close retention of "know how" by the relatively small number of operators familiar with the process and the relatively high price of the laminates, due primarily to resin costs.

Developments in plastic foams: *by W. C. Goggin and O. R. McIntire,* Dow Chemical Co.—A plastic foam is an expanded, high molecular weight plastic having a distinct cellular structure. These foams are characterized by their light weight, low thermal conductivity, good strength-weight ratios and, in many cases, good water resistance. They have been found useful in refrigeration insulation, buoyancy agents, sandwich structures, building construction, displays and novelties.

During the war, several unique plastic foams were produced in Germany. They were based on urea formaldehyde, polyvinyl chloride with an ingenious type of foaming agent and on polyurethane. The bulk of the work on plastic foams in England seems to have been in the field of calcium alginate and polyvinyl formyl, with some work having been done on phenol-formaldehyde, polystyrene and chlorinated rubber.

In the United States, the plastic foams which have attracted most interest are based on urea-formaldehyde, phenol-formaldehyde, cellulose acetate and polystyrene. Urea-formaldehyde foams were produced in quantity for flotation work even though they lacked water resistance. Phenol-formaldehyde and polystyrene were used with limited success for foaming-in-place applications. Cellulose acetate foam was announced late in the war and designed particularly for use in sandwich structures.

Fabrication: *by R. L. Davis and J. W. Knight,* The Fabri-Form Co.—Engineering and economic axioms direct many plastic applications to the fabricator. The limitations of press capacities for producing large parts often play into our hands.

Forming of thermoplastic sheet constitutes a large part of the work done by this division of the industry. Typical methods of forming thermoplastic sheet include drape forming, stretch forming, the vacuum snap back method (utilizing a vacuum pot), air blowing or blow molding, vacuum free forming, male and female combination die forming and Roto forming (a patented method employing centrifugal force to obtain the desired shape).

But while the volume of thermoplastic work is large, dollar-wise, the fabrication of thermosetting sheets, rods and tubes constitutes a greater percentage of the plastics industry. Because of the lower cost of thermosetting materials, and their mechanical and electrical properties, the demand for them has been very large. Thermosetting laminated sheets, rods and tubes are fabricated in much the same way as brass is turned, sawed, milled, drilled and tapped. Higher speeds can be used than are possible with thermoplastic materials.

Plastics in aircraft—a record and a challenge: *by La Verne E. Cheyney*, Battelle Memorial Institute—Plastics have been employed throughout aircraft, often for structural uses. They have also been used in the power plants, propellers and miscellaneous parts of the plane.

All plastic materials which have been used in aircraft possess some faults in one application or another and these faults indicate what needs to be done to assure plastics' place in this field. The transparent acrylics, for example, are somewhat difficult to form, have poor abrasion resistance, transparency to infrared, difficulty of de-icing, and a tendency to craze and creep. Radomes, constructed from laminated plastics and other materials, possess poor resistance to erosion by rain. Laminated plastics usually fail to stand the necessary static loads for direct structural applications. Many plastic materials possess insufficient dimensional stability. Practically none of the thermoplastic materials are sufficiently stable toward temperature change, while most of the thermosetting materials tend to be too brittle.

There is a trend toward lighter materials in construction; aluminum is already considered by many designers to be far too heavy for the planes of the future. One possible way plastics can satisfy need for lighter materials is in "sandwich" construction. Flammability is an important property of plastics for aircraft use.

Plastic dipping: *by Leonard Becker*, Engineering Research, S. Buchsbaum & Co.—Dipping is a method of processing in which a layer of film is deposited on a shaped form by means of repeated immersion of the form in a solution of plastic materials. Physical characteristics of the film produced by dipping include good tear strengths and high tensile and bursting test values. Scrap is as satisfactory as virgin plastic for this solvent process.

Equipment used for the work are solution kettles, tanks, molds, hoists, ventilation ducts and conveyors. For proper dipping, temperature in the tanks should be controlled within a few degrees, resin should be properly circulated so that no skimming is present, the solution should be bubble free and there should be condensation areas for the vaporized solvent.

Complete raincoats and shower curtains have been made by this dipping method and, in the future, such items as plastic dolls, surgical and swimming equipment may be made this way.

Properties of phenolic molding compounds: *by F. J. Donohue*, Monsanto Chemical Co.—Considering the volume of phenolic material produced each year there is a surprising lack of knowledge of the properties of this plastic, the resin used, the fillers and dyes—a void that this paper was designed to help fill.

Phenolic resins are classified as either one-stage or two-stage. A one-stage resin requires only further heating to polymerize after it has been discharged from the reaction kettle; a two-stage resin is permanently thermoplastic until after a subsequent stage during which hexa-methylene tetramine is added.

As for fillers, woodflour is probably the one most widely used. However, a molding compound filled with it would tend to absorb moisture. Cotton flock is similar to woodflour in its undesirable water absorption properties. However, it does have three to eight times better impact resistance. Chopped fabric also increases impact strength. Twisted cord filler gives the highest impact strength in molding compounds without sacrificing flow. Walnut shell flour will produce a glossy surface while inorganic fillers improve dimensional stability, heat resistance and chemical resistance.

The amount of colored pigment or dye used varies between two and four percent. Organic dyes are preferred to inorganic colored pigments because of the much higher tinting strength.

Effect of catalysts on polyester castings: *by John Delmonte*, Plastics Industries Technical Institute—The physical properties and the qualities of finished polyester castings are affected considerably by the nature and the proportion of catalysts employed in their preparation. Among the polyester type resins selected for this examination were Laminac 4116, Q-166 Experimental Plastics, Selectron 5003, Vibrin 103 and diallyl phthalate. The catalysts were benzoyl peroxide, tertiary butyl hydroperoxide, lauroyl peroxide and 90 percent hydrogen peroxide.

Tests were divided into three parts:

1) Sheets were cast between glass plates and evaluated.

2) Small compression specimens were cured at temperatures of 122, 165 and 212° F., for different periods of time. Good results are indicated particularly for t-butyl hydroperoxide and Laminac 4116. With some resins and catalysts, strength properties fell off with larger amounts of catalyst at higher cure temperatures.

3) Gel time at 212° F. was obtained on small 10-gram test specimens in glass vials placed in boiling water. Tests were carried out from 5 percent catalyst in some instances down to 0.01 percent catalyst. Diallyl phthalates were in general slower curing than the others; Q-166 yielded a more flexible type of polymer. Most rapid acting of the catalysts was hydrogen peroxide.

Laminates—their basic position as materials of engineering: *by R. L. Foote*, Synthane Corp.—The laminating industry is manufacturing at the rate of about 60,000,000 lb. per year, requiring about 30,000,000 lb. of dry resins, and about 15,000,000 lb. of cotton fabrics and 15,000,000 lb. of paper as fillers. Approximately 45 percent of the tonnage is used as electrical insulation; 40 percent is turned into mechanical, structural and chemical applications; 15 percent goes into decorative items.

The production of laminated phenolics is approximately equal to that of molded phenolics; materials are produced in a ratio of about one to five as compared to zinc (the smallest of major metal tonnages) and approximately 1 to 322 as compared to steel.

Real tonnage in post-forming materials, low pressure and contact laminates, high strength paper, glass fabric and rayon base materials will not be obtained until engineers come to know the products and use them in sound basic design.

Recent advances in copolymer resins for specialty uses: *by W. H. Aiken*, Goodyear Tire & Rubber Co.—Full-length article on this subject appears on pages 100–102 of this issue.

Standardization: *by Edward Borro*, Durez Plastics & Chemicals, Inc.—The growth of the plastics industry has not been without its obstacles and problems. These have related not only to materials but also to the design of plastic parts, the proper application of materials, methods of molding, mold design and construction and molding equipment, to name a few.

In spite of the educational work taking place today, there is definite need for standardization within the plastics industry. It would be impossible to cover all phases of the industry at this time but it would be most advantageous to the industry if we were to standardize on moisture variations, mold temperatures, compression molding pressures, transfer molding pressures, high impact materials, clamping pressure, transfer versus clamping pressure, hydraulic presses, as well as on mold sizes.

Molded laminated products: *by T. Walter Noble*, Plastics Div., Fabricon Products, Inc.—Molded laminated products are produced in molds from resin treated fabrics or papers and molded in shapes and curvatures making use of modifications of compression molding techniques. This method is distinguished from low-pressure molding which employs fluid pressure against a metal mold and from post-forming where previously laminated sheets are formed by means of heat and relatively low pressure.

Molded laminated products are characterized by: 1) high physical strength values, particularly in impact where the values are usually considerably higher than the impact values of the best compression materials; 2) excellent resistance to extremes of heat and cold; 3) good electrical insulation values; 4) good solvent and moisture resistance; 5) sound deadening properties; 6) high strength-weight ratio.

Molding pressures may range from 250 to 2000 p.s.i. depending upon the properties desired in the finished piece. Molding cycles depend on thickness of molding and material molded. Cure times on a $^1/_{16}$ in. cross-section vary from $2^3/_4$ to 12 minutes.

Materials for the Plastic Engineer: *by John Sasso*, Production Editor, *Business Week*—Any appraisal of the mate-

rials situation in the plastics industry must, of necessity, be surrounded with many 'ifs,' 'ands' and 'buts.'

In December 1945, the Plastics Materials Manufacturers Association announced expansion plans costing $107 million. This year it amended these to approximately $150 million—some accounted for by increased costs and about $22 million by additional planned expansion. This planned expansion will in all probability not be with us before the end of 1948.

Where are the bugs? First, the demand is said to be running close to three times the supply. Then, there has been a production capacity increase. MODERN PLASTICS, in its latest survey, reports a capacity increase in 1946 of 50 percent. Assuming product demand holds up and further machinery expansion takes place, there will be none-too-plentiful material supply even after expansion. The chemical situation is another problem.

The continuing round of strikes has aggravated the basic chemical supply situation, slowed down plant construction and injected a note of caution to some managements. Various projects have been shelved because government approval was lacking, because of insufficient financing or depression-jitters.

Dielectric preheating: *by T. N. Willcox,* General Electric Co.—This speech will be published in full in the March issue of MODERN PLASTICS magazine.

Auxiliary plunger transfer molding: *by Wayne F. Robb,* Shaw Insulator Co.—This molding method was described as helping to solve two serious problems which face the plastics industry: a) the rising trend in labor costs, and b) the difficulty in obtaining additional floor space for expansion.

The auxiliary cylinder must be the double-acting type and should travel at the rate of 150 in. per min. when moving unopposed. With a transfer cylinder of this type, the time of transfer should be from 4 to 12 sec. depending on the cycle variables.

As for runners, if they are too small, the material may set up sufficiently so that it will not flow through the gate section. On the basis of personal experience the minimum sizes should be 1/8 in. wide by 1/8 in. deep.

Excessively small gates tend to break up the filler and cause a reduction in impact strength. Further, no mold material has been developed to date which will withstand the abrasive action of the material passing through the gates. For general purpose material the gate area should be 0.0123 sq. in. per ounce of shot; form edium impact, 0.0138 sq. in. per ounce.; and for high impact, 0.0164 sq. in. per ounce.

As for the heating up of plastic material by friction as it passes through the gates, the coefficient of heat transfer of steel is so much greater than that of the plastic that the Btu added to the material must be very small indeed. (Editorial Note: This latter subject has created wide discussion and we would welcome the comments of anyone interested in this subject.)

Vulcanized fiber as an engineering material: *by G. A. Albert,* National Vulcanized Fibre Co.—There are two distinct types of fiber-making machines: a) the cut-down or cylinder machines, and b) the continuous machines. With the first, paper from a roll is run through a bath of zinc chloride, then between metal scrapers, after which it is wound on a large cylinder until the desired thickness of the material has been reached. The laminate is then cut from the roll and the resultant sheet passed through several weak zinc chloride-water solutions which leach out the stronger chemical, after which the final traces are removed by several baths of fresh water. These sheets, about 50 by 80 in., are then dried and flattened in low-pressure heated presses.)

In the continuous machines as many as 20 rolls of paper are simultaneously passed through the zinc chloride bath, the excess chemical removed by scrapers and the sheets run between cylinders which press and fuse the plies into a single laminate. This sheet then passes through the weak zinc chloride solutions and through fresh water tanks and is run over steam heated drums for the drying process.

Vulcanized fiber is made in two forms only—sheets and tubes. However, due to its exceptional machining characteristics, any shape can be fabricated. Machining of vulcanized fiber follows in general the methods used for metals, and standard machines as used both in metal and woodworking are adaptable for such work.

Live steam preheating: *Sven K. Moxness and Jerome Formo,* Minneapolis-Honeywell Regulator Co.—This speech is published in full on pages 141–147 of this issue.

Thermoplastic laminates: *R. J. Metzler,* Hercules Powder Co.—An article on this subject appears on pages 91–95.

Plastics mold release: *by Earl E. Ziegler,* The Dow Chemical Co.—A new test for the evaluation of plastics mold release consists of compression molding the thermoplastic to be tested around metallic test specimens, then measuring the force necessary to pull the specimens out. Results of the work done with this test indicate that: 1) The most highly polished surface is not necessarily the best for mold release. A fine grind or a matte finish seems superior. 2) Metals having a somewhat porous internal structure have better mold release properties than dense metals. 3) Apparently, a straight line function of mold release vs. draft angle exists between 0 and 5°. 4) Seven lubricants, particularly recommended for use on crystal clear polystyrene, cut pull-out force by as much as 80 percent. Outstanding for general injection molding are liquid silicones. 5) Changes in molding conditions, which result in decreased internal strain in the molding, improve release noticeably. 6) Every colored polymer tested for mold release to date has proved superior to uncolored polymer of the same type. Plasticizers improve release from rough surfaces; lubricants within the polymer are more effective on smooth or polished mold surfaces. 7) Polystyrene (clear) regular, required the greatest force, slightly over 400 lb., for pull-out; polystyrene (clear) improved, about 250 lb.; cellulose acetate (orange) about 180 lb.; cellulose acetate (red) about 150 lb.; ethyl cellulose (clear) about 120 lb.; methyl methacrylate (clear) about 110 lb.; cellulose acetate butyrate (clear) about 80 lb.; ethyl cellulose (black) approximately 75 pounds.

Polytetrafluoroethylene: *by A. J. Warner,* Federal Telephone & Telegraph Co.—In this paper polytetrafluoroethylene is examined from the viewpoint of the telecommunications industry.

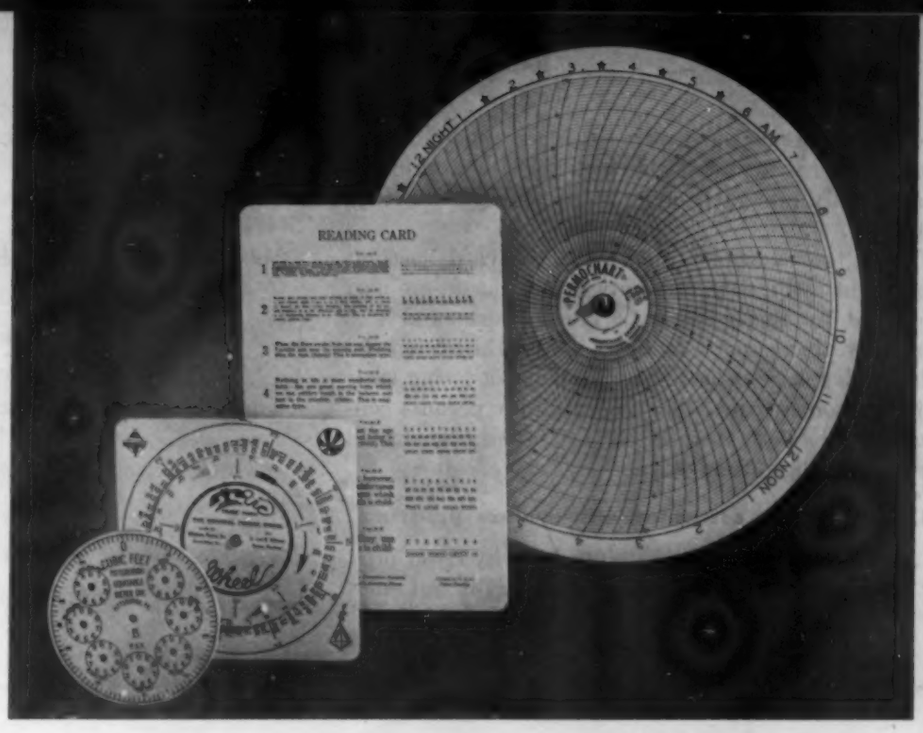
The electrical properties of the material have been measured at frequencies from 60 cycles to 3000 megacycles and found to vary considerably from sample to sample. The breakdown voltage is very dependent on the fabrication technique.

The material has been found to be remarkably resistant to the effects of many solvents and solutions. The physical properties of compression molded specimens have been examined and it has been found that the coefficient of the volume expansion on the samples measured is approximately 39×10^{-6} CC/CC/° C. for the temperature range 40° C. to 128° C., and 52.7×10^{-6} CC/CC/° C. for the range 128° C. to 200° C.

The behavior of polytetrafluoroethylene under load has been examined up to 200° C. It has been found that considerable initial deformation takes place even at relatively low temperatures, but once this deformation has taken place there is little further deformation even though load be applied for some time at 200° C.

Among the conclusions drawn is that much remains to be learned about methods of handling polytetrafluoroethylene.

S.P.E. consumer end-use specifications in the business machine field: *by B. W. Nelson and G. J. Wilson,* National Cash Register Co.—The primary goal in the program of the Business Machine Committee of the S.P.E. Consumer Specification Group in its effort to develop industry-wide "end-use specifications for business machines," was to group plastic applications by function, i.e., electrical, decorative, mechanical, optical and structural. In each group, information was supplied regarding the specific requirements of applied plastics materials. For example, in electrical applications, the properties of arc resistance, heat resistance, dimensional stability, etc., were judged by the various manufacturers to be among the important factors in such usage. This has helped to outline the ultimate objective of reaching consumer agreement on test methods.



1—Rigid vinyl laminates which may be printed by letter press, offset or by silk screen printing, have the quality of lasting for years and of not losing their utility through wear

Uses of printed vinyl laminates

A few products carefully made from printed rigid vinyl laminates has spelt success for one company

INGENUITY plus good application of materials, plus good workmanship has resulted in the development of an interesting business in printed rigid vinyl laminates by Allegheny Plastics, Inc., of Sewickley, Pa. The company concentrates on seven items, all related but each in the nature of a specialty.

2—Fabric laminated between vinyl sheet makes basket

First is the phonic wheel, a device composed of five laminated parts assembled with one eyelet (second from left in Fig. 1). On one side of the square base card is a round dial containing a variety of word endings; on top of this is a movable circular dial on which are printed word beginnings; between the two is a transparent movable circular segment containing alternate word endings. Both the top circular dial and the center segment dial are moved by means of small raised bumps in the material.

A child using this wheel can change beginnings and endings of words at will to increase his knowledge of vocabulary. It is possible to teach a youngster to read, spell and pronounce more than 500 of the recommended phonic words by means of this wheel. On the reverse side of the chart is a two-color dial with two movable hands. Using this arrangement a child may be taught the time of day, the months and the seasons. The educational product is being manufactured for L. and E. Edkins, and is in the process of being patented.

The Permochart for recording instruments (extreme right in Fig. 1) is guaranteed for normal daily use for two years as compared to the ordinary 24-hr. life of the common paper chart. Recording ink is wiped off the chart with a damp cloth, and the chart may be reused indefinitely. These charts are used extensively with industrial recording instruments and are mat

surfaced. Gage dials (extreme left in Fig. 1) and wiring diagrams, also for industrial use, have their printing permanently protected under shiny transparent vinyl surfacing.

Vision test charts and near-sight test cards (second from right in Fig. 1), both with mat surfaces, are also produced by this company. These charts and test cards give increased readability. And they have the added advantage of lasting years and not losing their utility through wear. The use of plastic permits controlled readability, the utilization of either transmitted or reflected light, and it ends surface reflection.

Letter press, offset or silk-screen printing

All of the printed pieces are prepared by letter press or offset with the exception of a large sight test chart which is silk-screen printed. And all of the items are over-laminated except the vision test chart. Conditions for laminating are fairly standard. Depending on the type of work being done, temperatures range between 240 and 300° F. while the pressures range from 200 to 1,000 p.s.i.

A decorative item is added

The company has recently introduced a line of waste paper baskets (Fig. 2) which are produced by laminating a sheet of colored fabric between two sheets of vinyl. Decorators who wish to match room accessories with drapes or slip covers now use this service to make waste baskets of the same fabric. The resulting product will not support combustion, is waterproof and washable, and the total weight is but 20 ounces.

A vinyl sheet for fruit packaging

A vinyl wrapping, known as the Rolite cover, has been developed by the Rowe Packaging Co., Ltd., of Toronto, Canada, for use in fruit packing. The advantages of this covering lie in the fact that it is transparent and consequently displays the fruit in its true colors, and that it is perforated so air can circulate through the package. Further, the vinyl covering can withstand cold storage for long periods of time without becoming brittle, limp or without losing its strength. And when Rolite covered packages of fruit are removed from cold storage, moisture condensation, due to extreme change in temperature, takes place on the cover rather than on the fruit. This company also makes the machinery for cutting and perforating the film.

The 1/1000 in. thick Vinylite sheeting used in this wrapping is perforated with a $^1/_4$-in. hole in each square inch of its surface. The number and size of the perforations was determined through extensive testing. It was found that too few perforations caused the film to fog after moderate temperature changes. Greater temperature changes caused moisture condensation which was harmful to the fruit. The tests also indicated that the distribution of perforations is an important factor in rot control—rot increasing with the decrease in ventilation.

The Vinylite film is shipped to cover manufacturers in rolls 36 in. wide. A machine, specially built for the purpose, cuts the material into three 12-in. widths, perforates it and cuts it into 21-in. lengths, ready for use by the fruit packer.

Applying the vinyl covering over a basket of peaches is accomplished by drawing a single sheet of the film tightly over the fruit and forcing the overlap under the basket's outer band with a blunt paddle. High tear-strength of the material makes this procedure possible.

Packaging tools in styrene boxes

Above—This red and black styrene kit, for hole cutting tools, represents a departure from older, more conservative forms of merchandising tools

Right—Precision tools, such as these auger bits, are firmly held in place and well protected during transportation and display by a styrene box

THE packaging of tools in plastic was first utilized by Bruno Tools, of Beverly Hills, Calif., as a better means of protecting tools during transportation, storage and display. The company believed that a plastic case would not only be stronger and less likely to break than previous containers, but that it might be made to protect the delicate parts of their precision tools and hold them firmly in place.

The first of the company's kits to be packaged in this manner was that containing hole cutting tools. Molded plastic boxes for an auger bit set and a boring bar set quickly followed. For all of these packages Lustron was used—selected in part because of its good dimensional stability.

In addition to the protective qualities offered by these molded polystyrene boxes, the company found other plus values in its new packages. Among these were the packages' ability to *sell* tools. This was first called to the attention of the manufacturer by dealers who reported increased sales of tools packed in the 1946 Christmas package made of black and red polystyrene. Much of the credit for increased sales in this package was laid to the color factor. It attracted attention and added to the appearance of counter displays—thus rousing consumer interest and stimulating sales which might not otherwise have been made.

Another plus value of the plastic boxes was their economy of production. After using cardboard boxes, paper containers, cellophane wrappings and wooden cases, and finding them expensive and unsatisfactory in one respect or another, the company was rather surprised to find the plastic boxes to be economical as well as suitable.

Needless to say, after the success of the first Christmas packages, Bruno Tools has made all subsequent tool packages in plastics.

South Gate Tool Engineering Co., of South Gate, Calif., does the molding of the cases. They are all made by the same methods, using the same material. Cases are molded in a four-plate stripper type mold with two plates floating. The mold is operated in a standard eight-oz. Reed-Prentice press. Interestingly enough, the cavities are in the cold half of the mold. A Markham Machine Co. hydraulic press is used by Cryco Inc., South Pasadena, Calif., to hot stamp the trademark on each case. The material for the trademark is a cellophane base paste supplied by Printers Supply Corp. of Los Angeles, Calif.

FRONT IS BACK in this radio housing

There is no unsightly side to this two-part molded phenolic radio housing; the unit can be set anywhere and yet present a good front to the listener. The design has also proved more efficient mechanically

ALL PHOTOS, COURTESY CROSLEY DIV., AVIATION CORP.

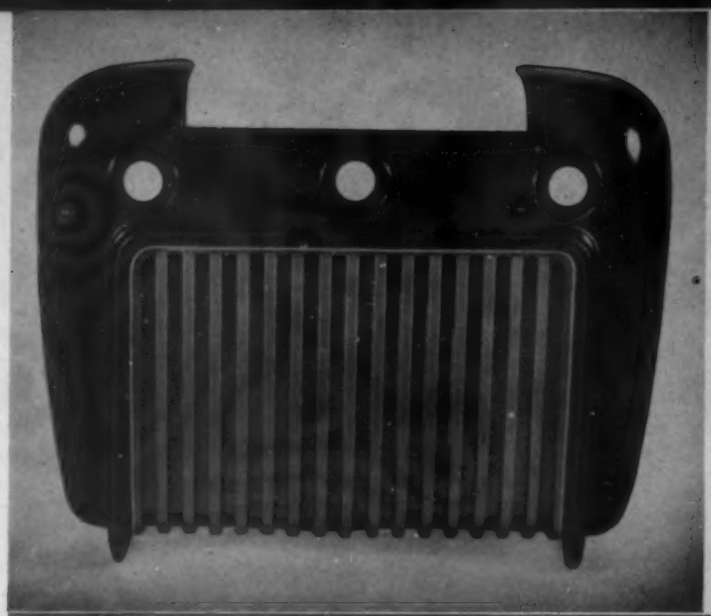
IT is to the formability, good surface texture and color of plastics that the Crosley Div., Aviation Corp., attributes much of the success of its design for the Duette radios. It was the stylist's objective in the design of the housings to overcome the "pretty front—ugly back" style characteristic of prewar models.

The trend of interior decoration has changed in the last few years. Furnishings have been shifted around for greater comfort and ease of conversation. Easy chairs and end tables have been moved out from the walls and are being grouped toward the center of the room. This rearrangement has, in many instances, placed the familiar table radio in a position where its open or unfinished back is in clear view.

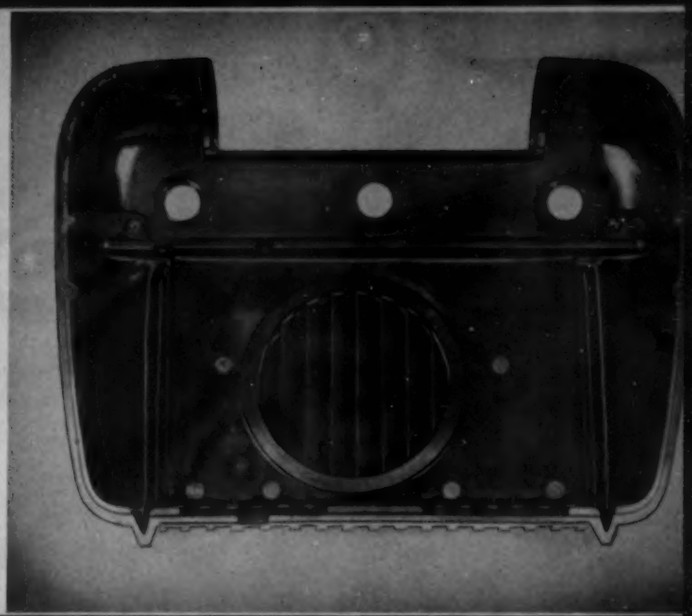
These new all-around housings were designed to afford the housewife complete freedom in the way she positioned her radio by making it possible for her to expose either or all sides of case. The company also wanted to keep down size and make it easy to repair.

After extensive tests the radio company decided that its ends could be best served by using plastics for the housing. A woodflour filled general purpose phenolic was finally selected for the molding of the cabinet; methyl methacrylate was picked for the dial lens.

How the complex curvatures are made practicable by the use of Durez or Bakelite phenolic can best be judged by reviewing the steps involved in the production of the single cavity molds used for each half of the case. The mold makers were supplied with the original sand cast aluminum cabinet and the final detailed drawings from



OUTSIDE FRONT



INSIDE FRONT

which they first made metal templates. Approximately 20 of these templates were needed to cover all the complex radii and curves which blend to make the streamlined contour of the cabinet. The aluminum model was used as a check. Aluminum castings were then produced and from these a duplicating machine transferred the contours to the steel molds which were subsequently chrome plated and polished to produce the high luster desired for outer surface of the molded radio housings.

The phenolic preforms, used in preference to powder, are preheated by high frequency with a view to reducing the molding pressure, shortening curing time and insuring a more even flow of material in the mold. The walls of the phenolic parts are approximately $^{5}/_{32}$ in. thick, a thickness which was found to have the needed strength and resistance to impact. Color is sprayed on.

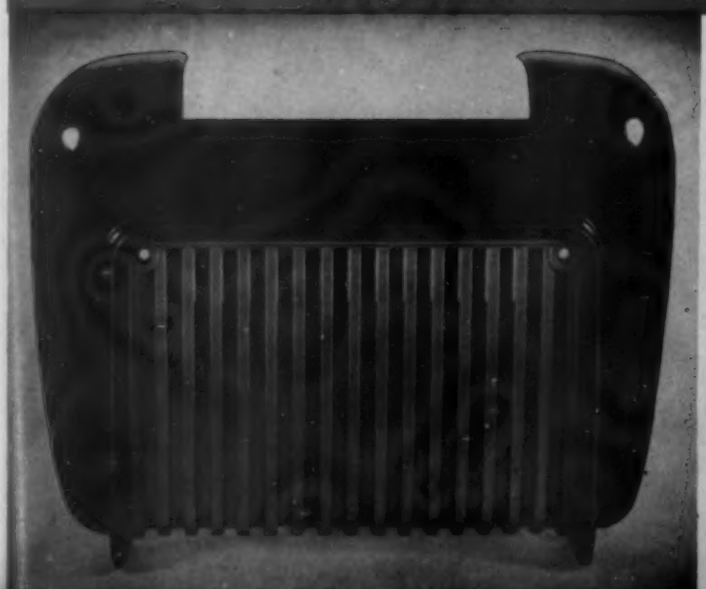
Particularly effective is the molded-in grille and the uninterrupted line of the housing where the two halves meet. The grille, incidentally, is sprayed with a second color in a finishing operation.

The absence of any obvious connecting and mounting screws also adds to the streamlined appearance of the radio. This last effect is achieved, in large part, by the use of molded-in inserts. For example, the chassis, on which the operating parts of the radio are mounted, is fastened to the front half of the cabinet by means of two machine screws extending through the flange of the chassis and into two threaded metal inserts molded into the inside of the front half. The rear half of the cabinet is fastened to the chassis with two small screws placed inconspicuously in the back grille near the corner of the frame molding where they are readily accessible for disassembly of the cabinet for servicing.

Methyl methacrylate was an obvious choice for the dial lens on this table radio because of its clarity and because its light transmitting properties assured good illumination of the dial. In addition the slight flexibility of the acrylic selected simplified the fitting of the lens in position between halves of molded phenolic housing.

The molding and fabricating of the plastic parts are the work of the Plastic Molding Co., of Cincinnati, Ohio, and the Continental Can Co., of Cambridge, Ohio.

OUTSIDE BACK



INSIDE BACK

An artificial gardenia, looking as fresh and delicate as a real one, has cellulose acetate petals, vinyl stem

Flowers that retain their beauty

TRANSMUTING the beauty of natural flowers to plastics is the achievement of William Farris of Alhambra, Calif. Taking cellulose acetate sheet, Tenite II rod, vinyl tubing and methyl methacrylate he fashions flowers that don't wilt, are rigid and moderately insensitive to water and heat. These plastic flowers look fragile, though you can bend them back and forth at least half a dozen times before they will break. And petal texture is lifelike.

Acceptable artificial flowers are not new, of course. They have been made from Japanese wood fiber, cloth, wax, paper and glass. But each has a major defect. Japanese wood fiber will wilt; cloth needs wire for support; wax is heat sensitive; paper is water sensitive; and glass is brittle.

Besides gardenias and orchids[1], Mr. Farris makes Calla lillies in miniature size for use as buttonnieres. The forming of the orchids gives an idea of how this work is done. The petals are first stamped from 0.030 in. cellulose acetate sheet stock, heated until soft, then quickly placed over the first of a series of jigs where the rudimentary shape is formed. After repeated heatings and formings, the orchid gradually takes shape. To make each blossom different, the operator crimps the edges with her fingers as her fancy dictates. The colors are applied by cold dipping in chemical dye after being shaped on the first jig. The pistils and stems are made from $^{3}/_{16}$ in. Tenite II rod stock. They are dyed, heated once for cementing to the blossom and reheated for final shaping after the blossom has been assembled. A finished orchid has a spread of 7 in., length of 7 in., height of 3 inches.

Gardenias are stamped from the same gage cellulose acetate sheet and chemically dyed in the same way. The blossom, however, is built from the inside. Petal blanks are heated and hand crimped into a bud and threaded over several fine copper wires which form the basis of the stem. The outer petals are threaded behind the bud and cemented in place. Extruded vinyl tubing is slipped over the wire to form the bark. A finished blossom is the same size as a natural one.

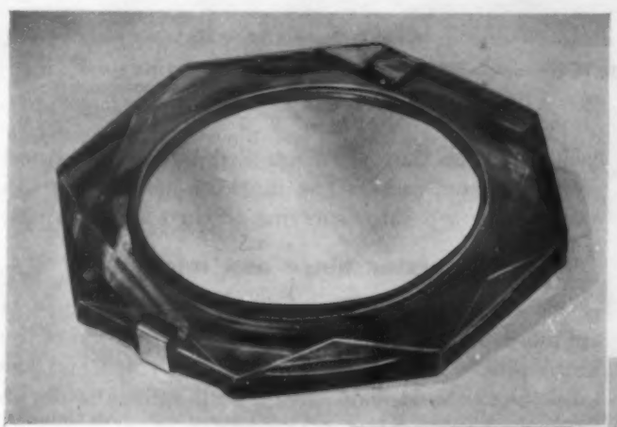
The Calla lillies are much easier to make. They are formed from 0.060 in. methyl methacrylate, the stems and pistils being made from $^{1}/_{8}$ in. acrylic rod stock. Methyl methacrylate is used for the lillies because it will hold its heat long enough to be curved around itself, flared open and the end tipped back and twisted. The lily blank is heated twice—once to shape the blossom and again to shape the stem and attach the pinback. After being cold dipped in chemical dye and tied with a ribbon, the lily is ready for its box. When finished it is $4^{1}/_{2}$ in. long, has a leaf spread of $2^{1}/_{2}$ in. and a 4 in. ribbon spread.

[1] "Orchids that are ever blooming," MODERN PLASTICS 23, 95 (July 1945).

Cutting compacts from acrylic sheet

Specially designed equipment makes possible the cutting of gem-like compacts from cast acrylic sheet in a high-speed, almost automatic operation

IT IS by fabricating, not molding, that the Bucklein Manufacturing Co. has been able to achieve high-speed production of gem-cut Lucite compacts that take full advantage of the fine optical and light-carrying properties of this plastic material. Using specially designed equipment this company cuts the compacts from cast acrylic sheets with maximum speed and precision and minimum labor costs, for the machines are largely automatic. Both the design of the product and the cutting machines are the work of Frank P. Bucklein, owner of the company, who built the equipment in his own shop.

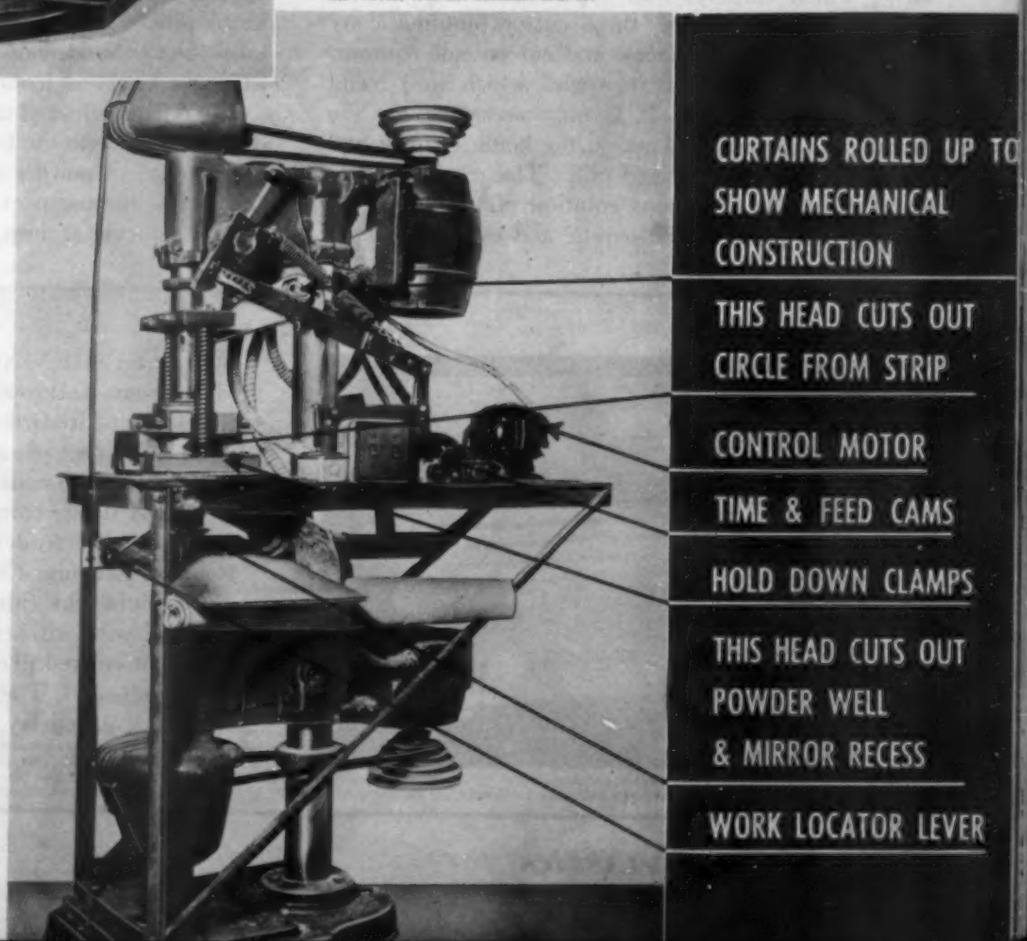


The initial cut

Standard sheets are cut into strips only slightly larger than the compact width. After being cut to width these strips are inverted in a machine which automatically locates and clamps them. One cutter comes up from the bottom and automatically cuts out the powder well or mirror recess, depending upon whether the top or bottom of the compact is being cut. At the same time a second cutting head comes down from the top and cuts an outside diameter slightly larger than the compact corners.

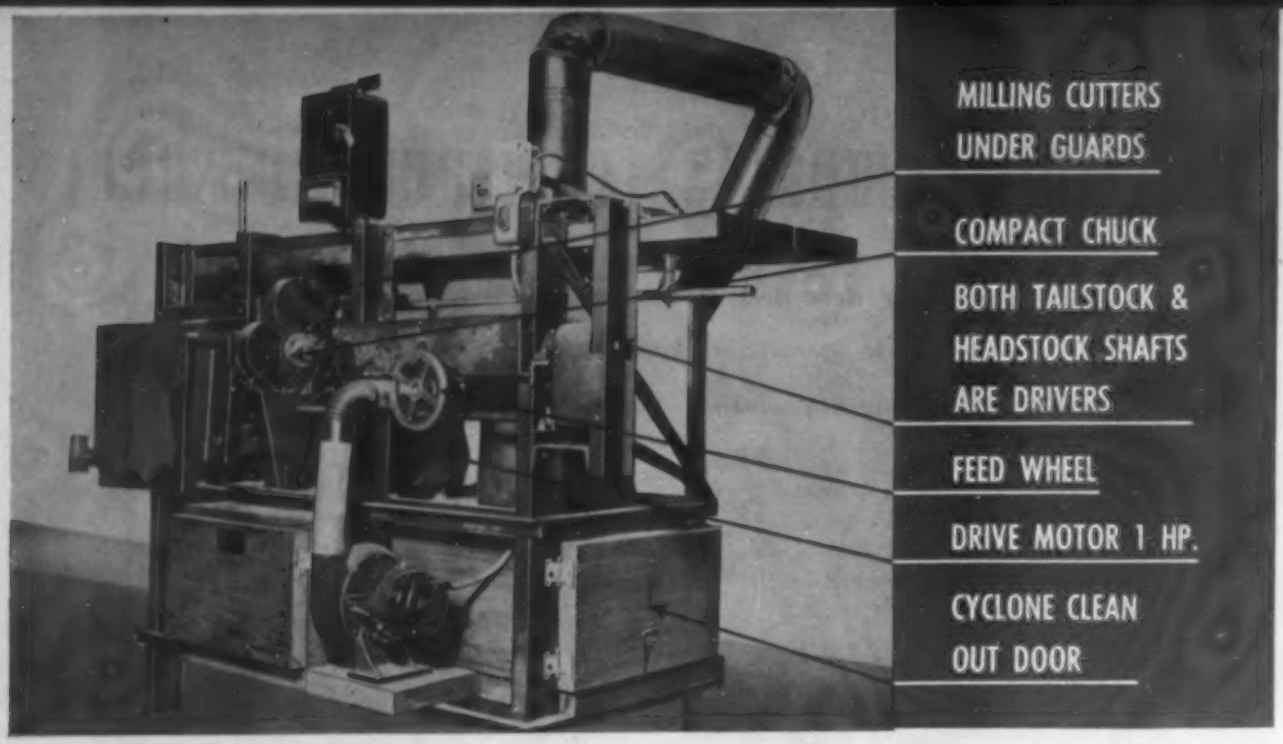
All the heads retract automatically; the clamping is released and the machine resets itself preparatory to repeating its cutting operation on the rest of the strip

ALL PHOTOS, COURTESY BUCKLEIN MFG. CO.


CURTAINS ROLLED UP TO SHOW MECHANICAL CONSTRUCTION
THIS HEAD CUTS OUT CIRCLE FROM STRIP
CONTROL MOTOR
TIME & FEED CAMS
HOLD DOWN CLAMPS
THIS HEAD CUTS OUT POWDER WELL & MIRROR RECESS
WORK LOCATOR LEVER

1—*This acrylic compact is entirely fabricated by two semi-automatic machines*

2—*Acrylic strips are fed into machine. One cutter comes up from bottom and cuts out powder well or recess in lid while another cutter comes down from top and cuts outside diameter slightly larger*



In second operation, acrylic disk is placed on specially designed cam cutting lathe which employes four separate milling cutters. These automatically generate diamond facets, cut outside contour at same time

of cast acrylic. It is only necessary for operator to push stock forward and push a button for this operation.

Cutting the facets

In the second operation wherein the facets are cut, each disk is placed on a specially designed cam cutting lathe, which employs four separate milling cutters. Working simultaneously, these cutters automatically generate the diamond facets and cut outside contour.

These facets have definite angles, which must blend at the proper points. It is only necessary for the operator to place the blank on the holding chuck and push the feed lever in and out. The machine automatically starts and stops rotation of the part. All cutting operations are automatic and exactly alike on each piece, as they are controlled by hardened and ground master cams. The machine has suction fan and cyclone separator carrying off dust and shavings.

Inserting hinge and mirror

Other operations in the fabricating of these compacts are more or less conventional with the exception of the hinge pins. These hinges are put in place and the hinge blocks welded on with a semi-automatic device which works almost instantaneously.

The mirror is locked in place with a flat band, which extends down into the bottom powder well and acts as a very efficient powder seal. It also helps to reinforce the rest of the compact. The compacts are available with either a metal clasp, or a Lucite pin clasp.

FOR FRESHENING UP THE HOUSEhold—kitchen, bathroom, office and/or sickroom —the Refresh-Aire Ozonizer Corp.'s portable unit may be called on to do a quick and thorough job. With a turn of the switch, ozone is generated into the room by its electronic tubes and within a few minutes the air is fresh and free of odors.

Boonton Molding Co., Boonton, N. J., compression molds the cabinet in an ivory urea to harmonize with kitchens and laboratories, and in a walnut-colored phenolic to match home and office furniture. The chassis is compression molded in a one-cavity mold of Bakelite high-impact phenolic.

Plastics and synthetic resin production

STARTING with this issue, MODERN PLASTICS will print the Census Bureau's plastics production statistics each month. Readers should note that this report varies from the annual Tariff Commission study, which covers all synthetic resins. This report is confined more closely to the plastics field. Outstanding development in November was decline in all production due to coal strike. Note that October production of polystyrene was largest on record.

These statistics represent the shipments and consumption of plastics and synthetic resins as reported by 78 manufacturing companies and company departments. Data for synthetic resins for protective coatings are not included. Shipments, for the purpose of this report, include data for plastics and resins which are manufactured by the reporting companies or company divisions and shipped to outside users. Consumption refers to the quantities of plastics and resins which are manufactured and used by the reporting companies or company divisions.

PLASTICS AND SYNTHETIC RESIN PRODUCTION—JAN. THROUGH NOV. 1946
From Statistics Compiled by Bureau of Census, Industry Division, Chemical Unit

Materials	*Total for first 9 months 1946*	*October 1946*	*November 1946*
Cellulose acetate and mixed ester plastics			
Sheets[a]			
Continuous (under 0.003 gage)	5,882,651	753,066	343,504
Continuous (0.003 gage and upward)	5,500,045	768,226	577,670
All other sheets, rods and tubes	3,740,246	457,635	151,933
Molding and extrusion materials	61,796,874	7,472,246	5,983,888
Total	76,919,816	9,451,173	7,056,995
Nitrocellulose plastics[a]			
Sheets	8,227,271	1,028,884	738,816
Rods and tubes	5,496,598	668,383	494,605
Total	13,723,869	1,697,267	1,233,421
Other cellulose plastics[b]	9,250,592	1,233,864	809,883
Phenolic and other tar acid resins			
Laminating (dry basis)	20,289,081	2,239,256	1,957,020
Adhesives (dry basis)	11,035,853	1,625,671	1,389,064
Molding materials[a]	111,179,584	9,686,188	8,770,827
All other (dry basis)[c]	43,467,212	4,622,775	3,994,192
Total	185,971,730	18,173,890	16,111,103
Urea and melamine resins			
Adhesives (dry basis)	28,492,623	4,519,163	3,869,496
Textile and paper treating (dry basis)	9,790,286	1,410,452	1,357,622
All other, including laminating (dry basis)[c,d]	1,685,670	351,267	829,377
Total	39,968,579	6,280,882	6,056,495
Polystyrene[e]	42,317,579	9,166,486	7,215,827
Vinyl resins			
Sheeting and film[a]	17,459,386	1,428,504	892,822
Textile and paper coating resins (resin content)	16,588,269	3,068,559	3,660,056
Molding and extrusion materials (resin content)	46,306,268	5,348,469	5,693,090
All other, including adhesives (resin content)[c]	17,871,821	3,098,444	3,209,380
Total	98,225,744	12,943,976	13,455,348
Miscellaneous plastics and resins			
Molding materials[a,g]	38,952,457	5,161,641	5,253,650
All other (dry basis)[h]	26,174,909	3,619,171	3,035,362
Total	65,127,366	8,780,812	8,289,012
Grand Total	531,505,275	67,728,350	60,228,084

[a] Includes fillers, plasticizers and extenders. [b] Includes methyl and ethyl cellulose and related plastics. This information represents a combination of moldings, extrusion materials together with sheets, rods and tubes. [c] Excludes data for protective coating resins. [d] Urea and melamine molding materials included with miscellaneous molding materials. [e] Dry basis, including necessary coloring material. [f] Total vinyl figure confused because of variations in company reports to Census Bureau. Actual resin figure is estimated to be several hundred thousand pounds more than shown here. [g] Includes data for urea and melamine, acrylic acid, casein and miscellaneous molding materials. [h] Includes data for petroleum resins, acrylic acid ester resins, mixtures and miscellaneous synthetic materials.

PHOTO, COURTESY MAXWELL ELECTRICAL PRODUCTS

Hot dogs require only 30 to 120 seconds to cook in this attractive red and black phenolic electrical unit. Lid and bottom of unit are compression molded in two-cavity mold

Putting insulating properties of

LONG CONSCIOUS of the heat insulating properties of plastics, many companies dealing in household appliances have made use of this characteristic in the manufacture of handles for irons, frying pans, pots and other utensils. But these familiar plastic parts by no means exhaust the possibilities for the application of this insulating property to the home appliance field.

Indicative of the diversified use that can be made of this property are three new, well-designed appliances which are adapted to the specific advantages offered by plastics. They are: the Dogmaster put out by Maxwell Electrical Products of Hollywood, Calif.; a baby bottle warmer made by Electric Steam Radiator Corp. of Detroit, Mich., and a percolator manufactured by Hartford Products Corp., Chicago, Ill.

High-frequency cooker

Six to 10 frankfurters can be cooked in the Dogmaster in from 30 to 120 seconds, depending upon the size of the frankfurters. The franks are placed in the Bakelite box, on either side of which is a set of electric coils. Cooking is on a principle of high-frequency induction.

Wood, metal and pottery were formerly used for the housing but conversion to plastics has proved most satisfactory because the material is non-conductive and offers a variety of color possibilities. The molding operations and assembly are all handled by Maxwell Products. A two-cavity mold is used for two-part phenolic housing and 10 operations are required for the assembly, which includes putting the unit in a carton and sealing. Red has been found most suitable for the lid and black for the bottom section.

Baby bottle warmer

Melmac was selected for the baby bottle warmer principally because it can withstand the action of boiling water and is available in pastel colors. The material also offers excellent insulating properties and possesses a hard, scratch-resistant surface. The bottle warmer is two-toned, in pastel blue and pink, and features a dual wall construction with air-cell insulation which never permits the outside surface to become hot.

In addition to its primary purpose as a bottle warmer, the streamlined product may be used to heat prepared

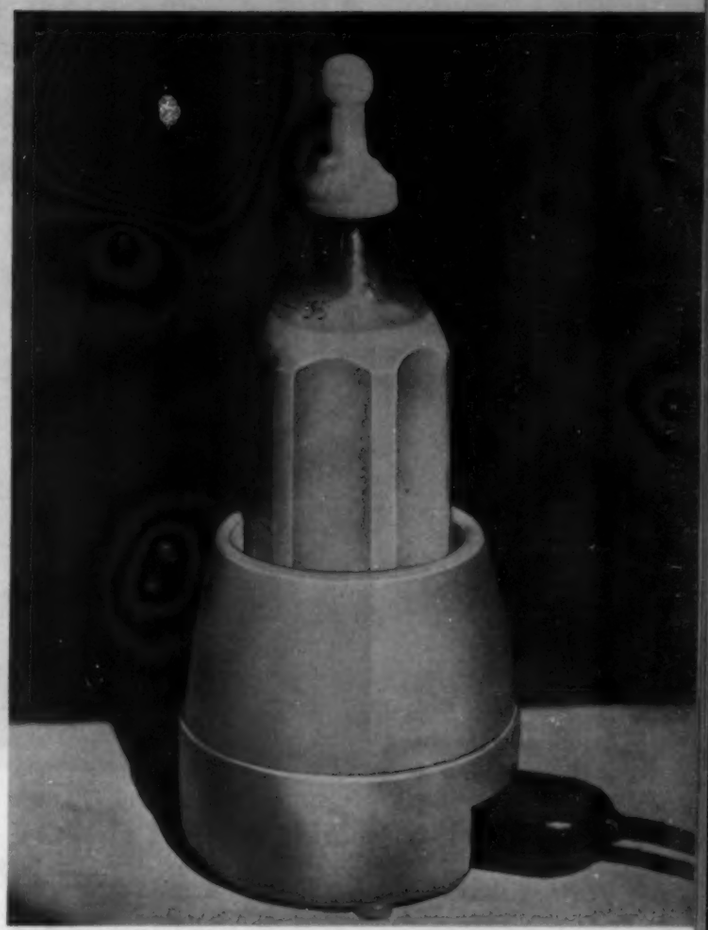
foods and boil eggs. It is sanitary and can be washed along with the dinner dishes in hot soapy water.

A new idea in percolator handles

As a result of redesigning, the new Hartford percolator has increased sales appeal and is simpler and more economical to manufacture. Most significant of the new features is the handle which was designed by Peter Muller-Munk, working in cooperation with Hartford Products' engineers. The outcome was a new method for attaching the handle to the body of the unit.

Conventional handle design employs two sockets which are riveted or welded to the body. Both these methods tend, in some cases, to make the handle appear separate from the overall design. In the new percolator, the shape of the body itself offers the means of attachment. The three parts of the new handle are molded of Durez. This phenolic material possesses a low rate of thermal conduction, is unaffected by relatively high temperatures and comes from the mold complete with a glossy black finish which is almost indestructible.

The three self-insulating parts are placed in a groove around the top of the aluminum body and are held in place by a stainless steel band. Thus the handle becomes a completely related functional and design feature. The broad bearing surface of the handle at its point of attachment gives it even greater rigidity than is usually found in the conventional design. The bottom attachment, ordinarily exposed to heat, is eliminated.



PHOTO, COURTESY AMERICAN CYANAMID CO.

This pink and blue baby bottle warmer of melamine, features an automatic shutoff and a dual wall construction

plastics to work

Overall unity is apparent in this percolator which makes use of a phenolic streamlined handle. Three parts are held in place by stainless steel band. Elimination of bottom attachment assures cool handle

PHOTO, COURTESY DUREZ PLASTICS AND CHEMICALS, INC.

Sure cure for housing problems:

...boost output 169%

High-powered cost cutting makes a strong case for any industrial process, and dielectric heating did just that when it sent production soaring 169% in this plastics operation.

The old way of producing heavy-sectioned motor housings involved molding powders in a two-cavity mold. But this required a 10-minute cure, limiting production to 130 pieces per day. Demand for a doubled output required another $12,000 mold (plus 14 weeks' waiting) and, in addition, the use of a second press.

The new way simply switched powders to preforms and preheated them with a standard Westinghouse 5-kw, r.f. generator. Results: curing time was slashed from 10 minutes to 3 minutes and production of the two-cavity mold rose from 130 units per day to 350 . . . a 169% boost!

Better yet, holes once drilled in the housing could now be molded since the new uniform plasticity reduced breaking strain on the mold pins.

This is just one example of the way dielectric heating does an effective, profitable job for the plastics industry. Ask your nearest Westinghouse office today for the full story. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-02074

HERE'S FREE HELPFUL INFORMATION

on both induction and dielectric heating . . . their principles and theories; where to use them; how to select them; actual case histories of their use. Write for your copy today, on your business letterhead, please. Ask for B-3620.

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Electronics at Work

Compounding plastic materials by a new method†

by JACK SANDLER‡

IN 1942, development work was started in the Research Laboratory of the Hungerford Plastics Corporation on a new process for the compounding of plastic materials. Like most research work, the progress was slow, tedious and often disappointing, but gradually problems that at times seemed beyond solution were solved. Now, after over four years of continuous development, this new process has proved itself in production and is ready to be shown to the industry in the belief it represents one more step in a forward direction.

The process itself, as now perfected, is exceedingly simple. The flake or resin, the dye, pigment, stabilizers, fillers, etc., are charged into a compounding chamber mounted so it can be rotated. While the chamber is rotating, the plasticizers and other liquid additives are injected into the chamber by means of a spray. After processing, the mass is dehydrated, then discharged into a drum ready for molding.

The principle advantages of this process are:

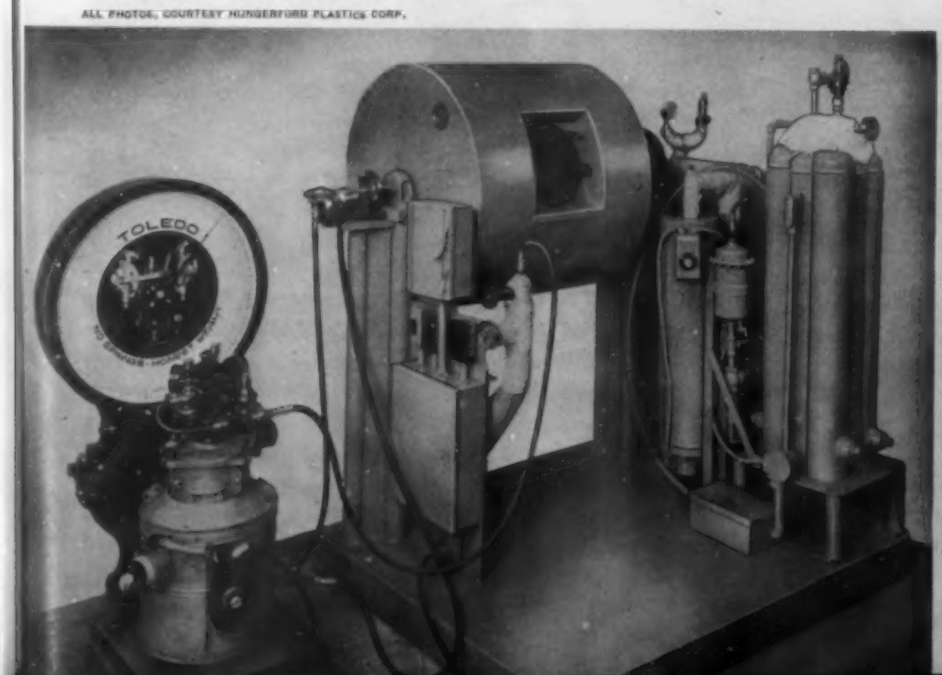
1. It produces molding material at a low cost.
2. Smaller material inventories are possible.
3. It permits a wide flexibility of formulation and color with a comparatively small raw material inventory.

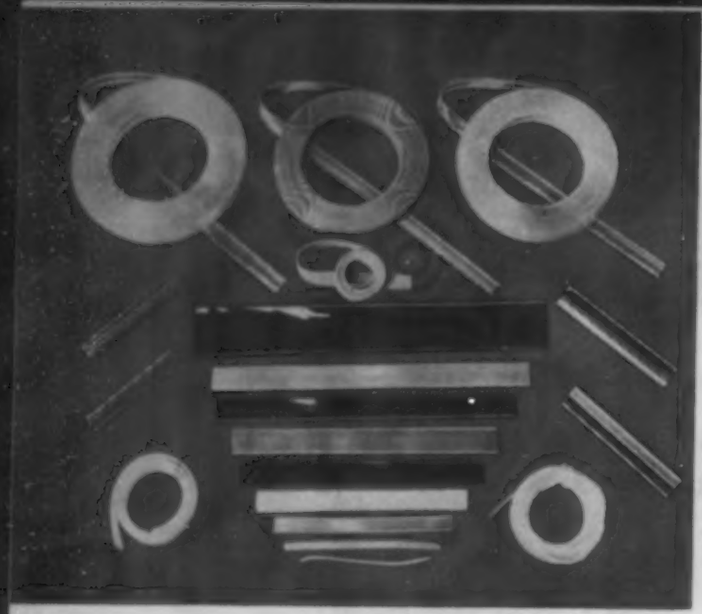
(*Please turn to next page*)

* Reg. U. S. Patent Office.
† This new method is known as the Hungerford Process.
‡ Vice-president Hungerford Plastics Corp., Murray Hill, N. J.

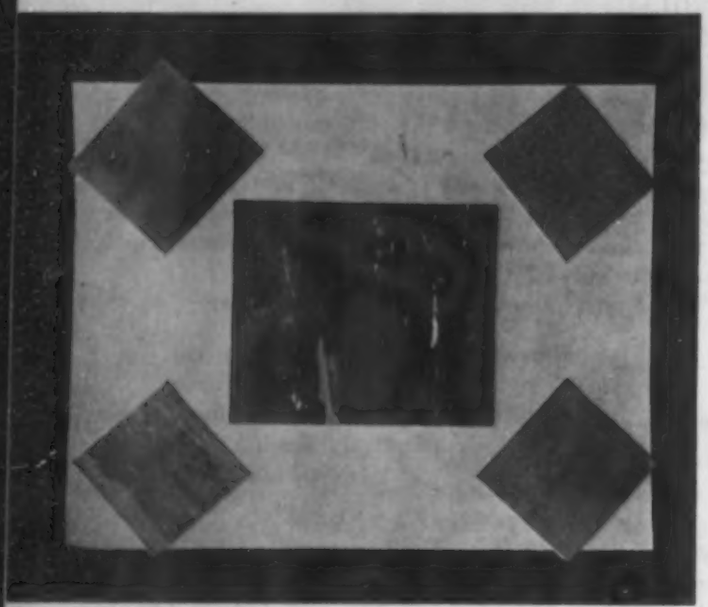
Left—This laboratory machine, which has a capacity of 40 lb. of plastic material per hour, can plasticize resin or flake so uniformly and distribute other components so evenly through the mass, that fusing and mechanical working are not necessary. Right—Compounded material dumped from the machine is ready for molding

ALL PHOTOS, COURTESY HUNGERFORD PLASTICS CORP.





Extruded products such as this vinyl tape and other sections can be made from vinyl compounded by this method



This vinyl flooring and cellulose acetate laminate were produced from materials compounded by new process. Compounding vinyl in this way permits the use of exceptionally large quantities and varying types of fillers

The Hungerford Process is fundamentally different from the solvent method, the Banbury method and the hot roll method of compounding plastic materials in that the material remains in powder form throughout the process. In other words, by this method, resin or flake particles are so uniformly plasticized and all other materials in compound so evenly distributed through mass that fusing, mechanical working are not necessary.

Early research

When work started on this project in 1942 it was not the first time that an attempt had been made to compound plastic material without fusion, mechanical working and subsequent mechanical disintegration. The patent office records show many such attempts. In March 1934, a patent was issued to George Schneider, technical vice-president of the Celanese Corporation of America, and assigned to that corporation, on a method of mixing cellulosic flake and plasticizer in the presence of a penetrating agent for the cellulose derivative while both the cellulose acetate and the plasticizer are in suspension in a liquid. This is obviously a slurry method and would require the evaporation of the liquid before a moldable material could be obtained.

In April 1934, a patent was issued to Henry Dreyfus, of London, England, covering the process of producing plasticized cellulose derivative with a plasticizing agent. A year later Mr. Dreyfus was granted a patent which disclosed the process of producing plasticized cellulose derivative by means of spraying the cellulose derivative with a liquid containing the plasticizer and then evaporating the carrying liquid.

Still later, in December 1941, Henry Moss was granted a patent (assigned to the Celanese Corporation of America) on the process of producing plasticized cellulose material by moistening the base material with a non-solvent, spraying the moistened material with plasticizer and then evaporating the moistening liquid.

These four patents are by no means all of the previous attempts on record to plasticize plastic flake or resin without putting the materials into a homogeneous fused mass, but they are representative of the work done.

Two objectives

When development was started on the Hungerford Process, the engineers had two objectives. One was the perfection of a compounding process which would permit the compounding of high quality plastic molding materials without the use of solvents or slurries or without the necessity of fusing the mass and subsequently subjecting it to mechanical disintegration. The second objective was the development of relatively low cost equipment to carry out low cost operating.

The first step was the setting up of a complete pilot plant to produce molding compound by the solvent and hot mill processes so that comparative controls could be maintained in the development of the new process. Then came the designing and manufacture of the first experimental equipment.

Progress was slow, but by the spring of 1945 commercial cellulose acetate molding powder was being produced in production quantities and being molded in regular production on injection and extruding equipment. From that point, the project became one of refinement of the small but important details that are so essential to the success of any development.

After a great deal of experimental work it was determined that the process under development, combined with a modification of the principle of the Dreyfus spray process (referred to above) gave the best results. As the patent for the spray process was owned by the Celanese Corporation of America, Mr. W. Stuart Landes, vice-president of that company, was contacted

and a contract was negotiated permitting use of the Dreyfus spray invention with the Hungerford Process.

As development proceeded in cellulosics, work was started on the compounding of various types of vinyl materials. It was found that the same principle of compounding, but with important modifications, worked well on the rigid as well as the elastomeric types. This development work also showed that this process of compounding permitted the use of large quantities and varied types of fillers, and that an excellent homogeneous dispersion of filler was obtained.

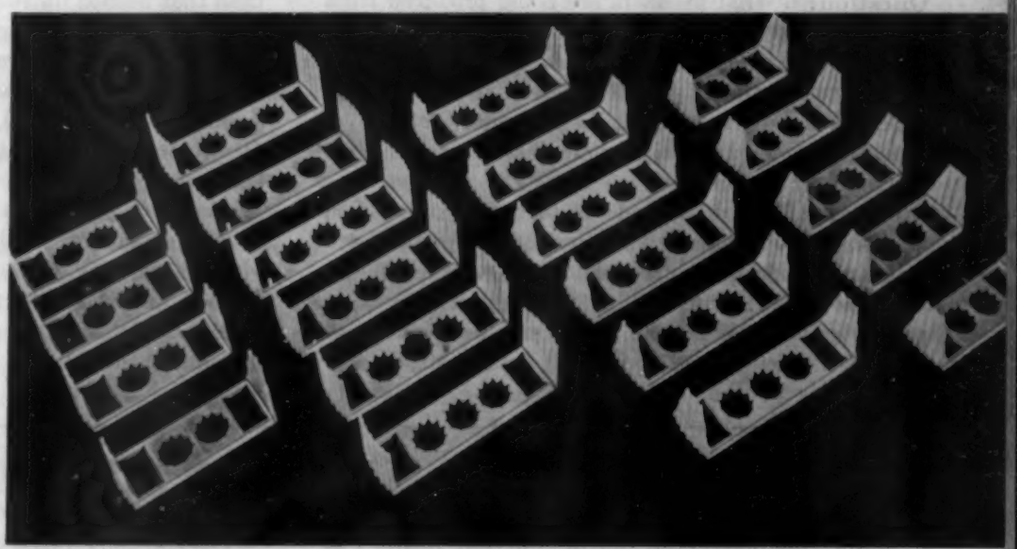
A typical compounding job

The process, as now perfected, is exceedingly simple. Just how simple is well exemplified in the following description of the compounding of cellulose acetate in a 1000-lb. Plastimaker. First, 1000 lb. of cellulose acetate flake and the colorants are charged into the compounding chamber while approximately 500 lb. of the plasticizer is run into the jacketed liquid reservoir. The compounding chamber is then revolved for approximately five min. at very low rate of speed. It is at this point that the atomized plasticizer injection cycle is started. This takes approximately 40 minutes. The compounding chamber continues to revolve at the same rate of speed throughout the plasticizer cycle.

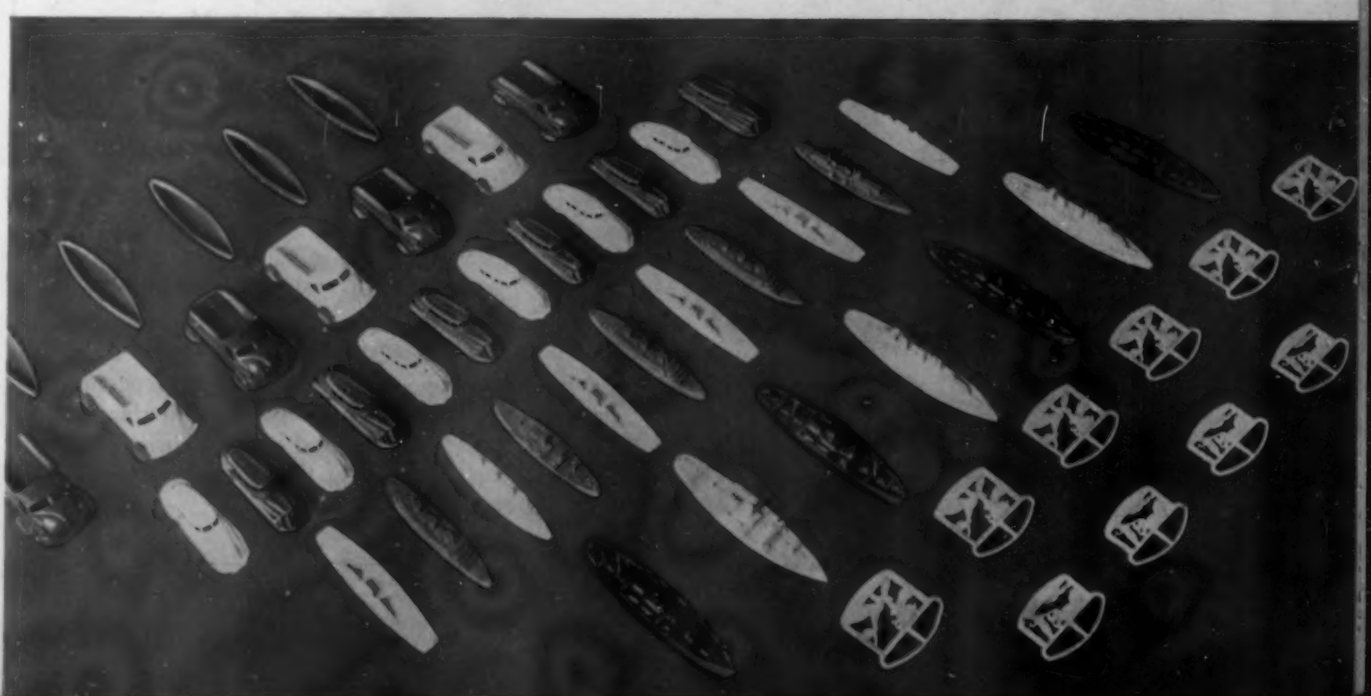
After the completion of the plasticizer cycle, the dehydration cycle is started. Dehydration is accomplished by filtering a volume of dry hot air through the material. This air is automatically and continuously exhausted to the atmosphere throughout the cycle which takes about 30 minutes. The compounded material is ready for molding at the end of this dehydration operation.

The total weight of the finished compound is approximately 1500 lb.; total time required from batch to batch about one and a half hours. The power consumed in the compounding of one batch of material such as described above is approximately 50 kw. hour. This represents a power cost of less than 0.001 cent per pound of compounded material.

The same general principle of compounding is used for other materials (such as the vinyls) except that the



Quality of plastic material compounded by this method is clearly shown in these cosmetic bottle holders injection molded of cellulose acetate



The low cost of this compounding method is an important factor in molding such articles as these cellulose acetate toys

cycles and conditions are varied in accordance with the materials and formulation. The over-all compounding time is generally less for vinyls than for cellulose acetate.

Advantages of new process

We do not believe that this new process is a cure-all for all compounding problems, but enough data has now been assembled to show that where it is applicable it can often improve quality and lower cost. The following questions and answers should help to define the field of application for this process, and point up its advantages.

Question: What size machines are available?

Answer: The Plastimaker is now being produced in 40-lb. (laboratory) size and in 150, 300, 600 and 1000-lb. sizes.

Question: Is the process now used in production?

Answer: Yes. Licensing was started early in 1946 and there are now a number of licensees in the United States. Mexico has been licensed.

Question: What products are being produced from material compounded in this manner?

Answer: Plastic flooring, brush backs, toys, wire coating, pocketbook handles, novelties, automotive moldings and extrusions, belting extrusions; etc.

Question: What is the approximate cost of compounding by this process?

Answer: The cost depends on material, formulation and size of machine. The cost of compounding a standard formulation of cellulose acetate in a 1000-lb. machine would be less than 2 cents per pound at present prices. With flake at 42 cents per pound and plasticizer mixture at 27 cents, the total cost of material ready to mold would be less than 39 cents per pound.

The cost of compounding vinyl resins in the 1000-lb. machine would be less than 1.5 cents per pound.

Question: Does the machine used in this process require much power?

Answer: No. Even the 1000-lb. (1500-lb. batch) machine requires only 5 hp. for operation.

Question: Are raw materials readily available?

Answer: Not at the present time. Cellulose acetate, ethyl cellulose, the vinyls and their plasticizers have been tight for some time. There is some indication of a freer supply during 1947 but anyone considering putting in the Hungerford Process who does not now have sources of supply for raw materials, should first make sure of raw material supplies.

Question: Do you require a chemist if you do your own compounding with this process?

Answer: No.

Question: Is much floor space required?

Answer: No. The overall floor space, because of the reduction in inventory stocks, would probably be less than that needed for stocking molding granules.

Question: How much plastic material should a molder be using before he considers putting in the equipment for this process?

Answer: At least 200,000 lb. of material per year.

Question: What materials have been successfully compounded by the process?

Answer: Cellulose acetate, ethyl cellulose and other cellulosic plastics; polyvinyl acetate chloride, polyvinyl chloride, polyvinyl acetal and polyvinyl butyral. In fact, any plastic material requiring the addition of an external plasticizer can, so far as is known, be compounded in this way.

SETTING TRAPS IS AN OLD STORY TO the American Trap Co. of America, Lititz, Pa., who has long been in the business of destroying pests. One of their newest innovations is the Victor "Black Cat," designed by George Sakier, which is able to snare four mice with one setting.

The company molds the one-piece trap housing of Bakelite or Durez in a Stokes press using multi-cavity dies made by Eagle Tool & Machine Co. of Newark, N. J. The phenolic side walls are reinforced by a molded-in arched fluting. This fluting also modernizes the appearance of the mousetrap. Assembly of the unit is accomplished in one operation. It consists merely of inserting the trap wires through the molded-in holes and stapling them in place.

The "Black Cat" replaces a wooden magenta-colored mousetrap. Plastic was chosen for the housing because it does not hold odors and is washable—qualities that make the trap more sanitary. The phenolic trap is also more economical to make. It requires only two manufacturing operations—molding and stapling—whereas a wooden trap must be put through six operations before completion.

Preheating plastics with live steam

by S. K. MOXNESS and JEROME FORMO†

A NEW version of an old technique of softening molded materials, developed and used with success by our company, involves the addition of moisture, usually in the form of steam, to the molding material previous to loading it into the mold. Very simple and inexpensive preheating cabinets are used in which an atmosphere of saturated steam is maintained. These cabinets may or may not be heated by additional heat sources, such as infrared heat lamps or electric resistance elements (Figs. 1 and 2).

In the present stage of development, our company has found that charges preheated by this system produce transfer molding results which are approximately equal to those produced by high-frequency dielectric preheating in every respect but electrical characteristics. Parts transfer molded from material preheated in this manner are cured in a shorter time, are more easily released from the mold and do not stain the mold as rapidly as when dry powder is used.

One of the important values of this system is believed to be its simplification of the preheating of material for fully automatic transfer molding—one of the main problems in development of automatic equipment (Fig. 4). One other feature of this type preheating is the economy of preheating loads for castings of almost unlimited size. Castings weighing 10 to 15 lb. require high-frequency units costing up to $10,000; steam ovens for the same load, in contrast, may cost from $300 to $400.

MODERN PLASTICS is printing in full this article on live steam preheating because of its significance to the plastics industry.

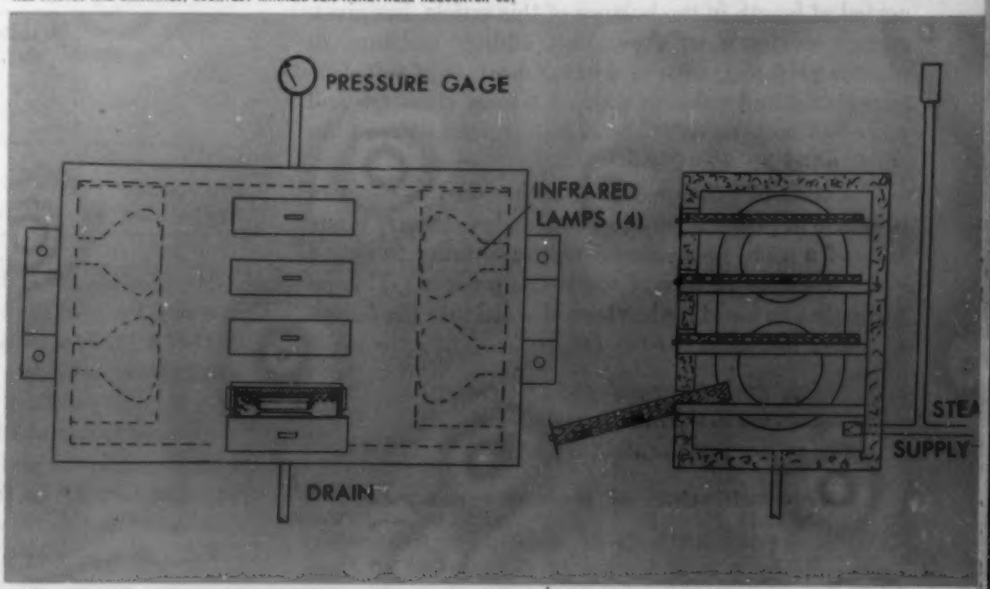
In the March issue we will present the complete text of the speech on "Di-Electric Preheating" given by T. N. Willcox of General Electric Company at the S.P.E. Annual Technical meeting at Hotel Congress in Chicago on January 30.

The problem of preheating plastics has become one of major importance throughout the molding industry. While several factors are responsible for this, probably the chief factor is the large-scale use of the transfer molding process. For this process it is imperative that the molding powder be softened to some degree in order that transfer of the material into the mold cavity may be accomplished. Obviously, it is of advantage to have the material softened before the cycle begins, since time is thus saved which would otherwise be used in heating the powder charge in the transfer chamber. For this reason many molders have invested large sums of money in various types of preheating equipment. This equipment has been used chiefly to heat the material though in some cases it is also used to dry the plastic before it is molded. (*Please turn to next page*)

* Presented before the Annual Technical Meeting of the Society of Plastics Engineers, in Chicago on Jan. 27 through Jan. 31.

† Chief process engineer and supervisor of the Plastics Laboratory, respectively, of Minneapolis-Honeywell Regulator Company, 2709 Fourth Ave., Minneapolis, Minn.

ALL PHOTOS AND DRAWINGS, COURTESY MINNEAPOLIS-HONEYWELL REGULATOR CO.



1—Cross-section view of a simple type of steam preheating cabinet showing position of infrared lamps which speed up preheating

2—This circulating oven, for preheating compounds with steam, handles over 30 lb. of material at one loading. It is used in combination with the press shown in Fig. 3

Research carried on in the Plastics Laboratory of Minneapolis-Honeywell Regulator Company has proved that another factor in addition to heat is of importance in preconditioning molded material. This factor is moisture. This research work, which is reported at length in the balance of this article, has given enough evidence to show that adding moisture to plastics preforms, with or without heat, is of sufficient importance and value to warrant a more thorough and more comprehensive study of the entire process from start to finish.

The lack of published information on the effect of moisture in phenolic powders has made necessary many tests of a more fundamental nature in order to gain a more complete picture of the entire process. This information on moisture has been divided into the following three categories:

1. Moisture in the powder and in preforms.
2. Moisture in the molding operations.
3. Moisture and the molded part.

Determination of moisture content

While several methods of moisture determination are available, a modification of the method of Dean and Stark[1] was found to be most satisfactory for this problem. Once the moisture content of a given sample was determined by this means, any addition or removal of moisture was determined by change in sample weight.

It has been found that the moisture susceptibility of phenolic molding materials may vary considerably from one material to another, depending largely upon the type of filler. But, even within the general-purpose woodflour filled group there is considerable variation in the quantity of moisture which these powders will absorb. For example, Bakelite 14571, when stored at 52 percent relative humidity, reaches equilibrium at about six percent total contained water; for Durez 791 the figure is about 11 percent (Table I).

Table I.—Equilibrium Moisture Content at Room Temperature

Relative Humidity	*Bakelite 14571*	*Durez 791*
percent	*percent*	*percent*
10	1	1.1
20	...	2.3
32	2.4	2.7
43	3.9	5.2
52	5.7	10.8

Heating preforms in moist atmosphere

Early in this problem a series of measurements were made on the rate of heating of preforms under dry and moist conditions. The internal temperature of preforms of various materials was recorded at one minute intervals while the preforms were exposed to dry heat at 212° F., dry heat at 300° F. and moist heat at 212° F. For rag-filled and woodflour filled materials the rate of temperature increase in the moist heat was about the same as that in the dry oven at 300° F. However, for asbestos-filled material there was only a slight change in temperature rise from the dry oven at 212° F. to the moist oven at 212° F. (Table II).

Table II.—Rate of Temperature Increase, °F./Min., for Interval from Room Temperature to 160° F.

	Makalot 93C (rag-filled)	*Bakelite 14571*	*Durez 791*	*Resinox 3827 (mineral filled)*
		(general-purpose, woodflour filled)		
Moist heat 212° F.	6.12	12.5	10.6	11.6
Dry heat 300° F.	6.83	11.7	12.2	19.7
Dry heat 212° F.	2.73	5.55	5.57	8.6

More significant is the fact that when preforms heated in a moist atmosphere reached an internal temperature of 180° F. they were soft enough to be transfer molded while preforms heated in a dry oven to this temperature were still very stiff.

Another factor which enters into preheating preforms with steam, is the preform density. An optimum density can usually be found for each type of material. Increasing the density by packing the preforms under

[1] Dean and Stark, A.S.T.M. D95–40 (Adaptation by Monsanto Chemical Corp.).

higher pressure serves to slow down the rate of penetration of the preform by the steam. On the other hand, if the density is too low, preforms may easily crumble.

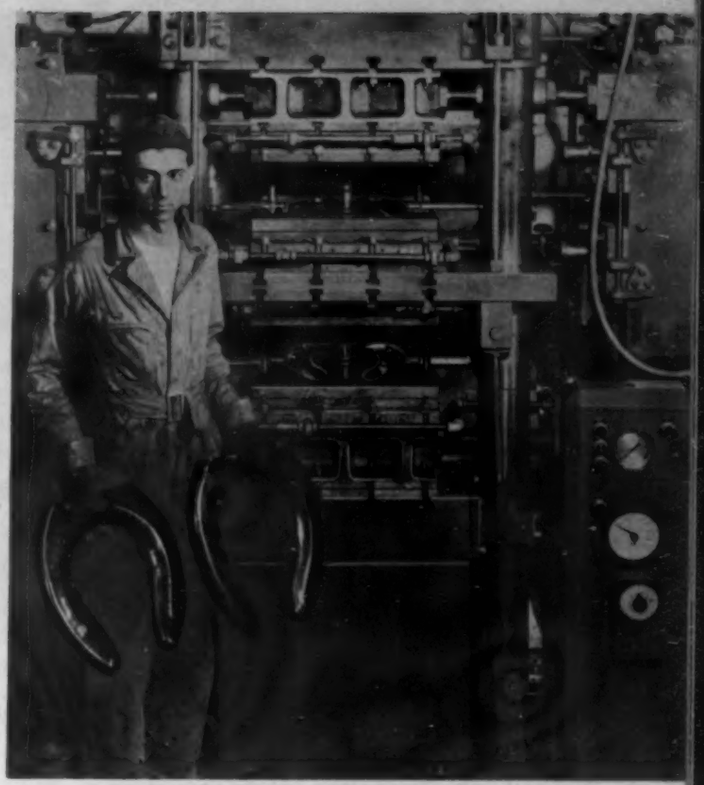
Moisture in the molding operation

Heating a thermosetting resin brings about a twofold reaction, a softening and a hardening process. The initial heat applied to such a resin serves to activate the molecules of the substance and to make them more mobile. The mobility of the resin is proportional to the temperature of the material. But at the same time that the mobility increases, the rate of polymerization also increases so that the material becomes more and more rigid. Thus it is important, in transfer molding particularly, to gain maximum mobility before hardening takes place.

The addition of moisture to the molding material serves to lubricate and thus allow the material to flow faster through the runner and gate. This probably causes a more rapid generation of heat due to friction at the gate which in turn further plasticizes the molding material. Measurements which have been made by others[2] have shown temperatures as high as 400° F. at the gate with conventional transfer molding. With more rapid transfer it is entirely possible that the temperature may exceed that value.

It follows that as soon as the material has passed through this high temperature heating zone, the polymerization reaction is highly accelerated, thus effecting a very rapid cure. This fact has been borne out experimentally as will be shown later on in the article in the discussion of moisture and the molded part.

The effect which varying moisture content has on the flow of molding powder is illustrated by Fig. 12. These values were determined on a Burns flow tester[3] using Durez 1898 powder. It seems obvious from a study of this graph that a complete flow figure should include

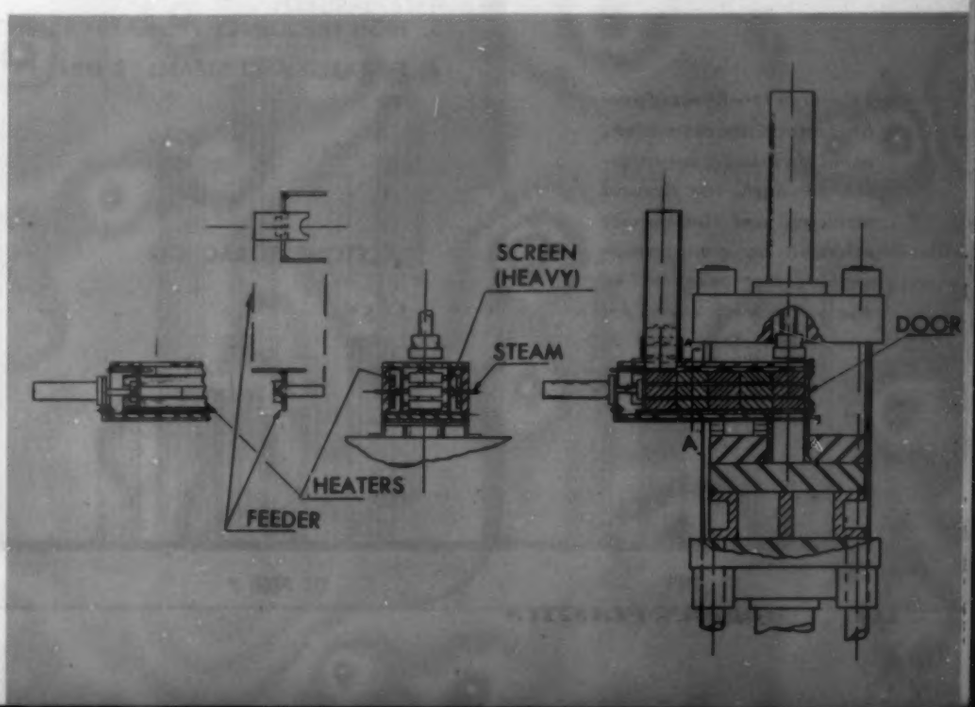


3—It takes 10 lb. of material per shot to make two toilet seats in this 350-ton press having four transfer rams

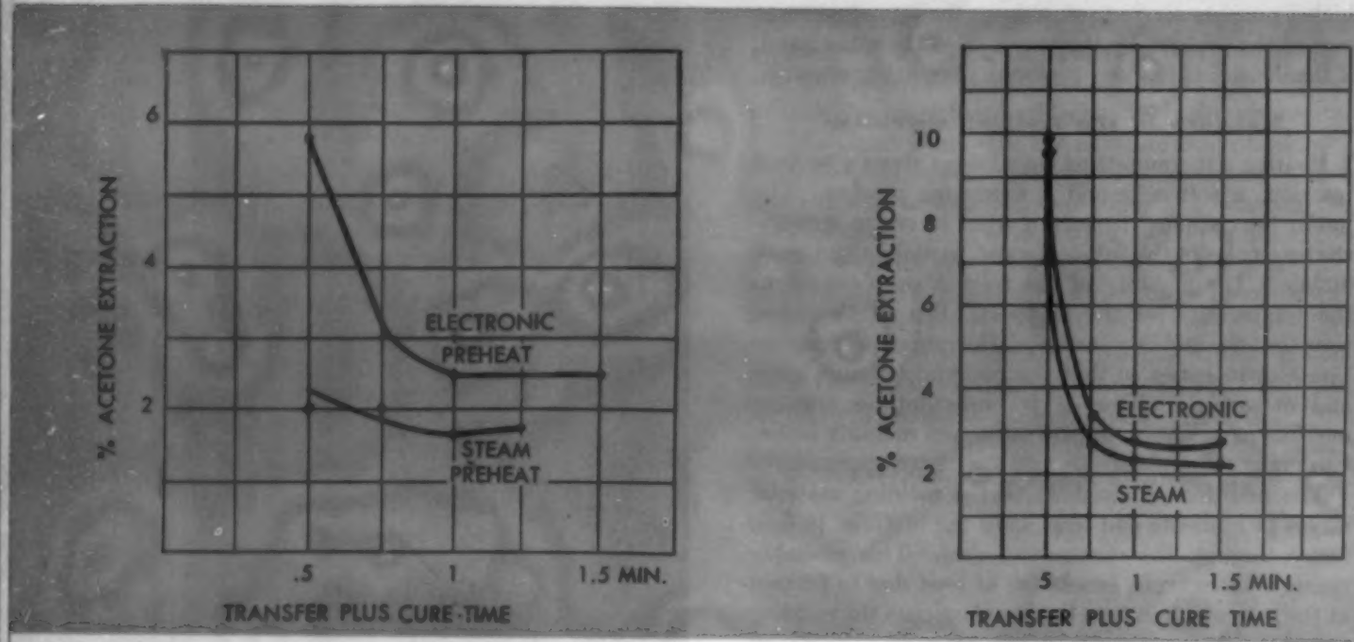
not only the test method but the moisture content of the material being tested. Values determined on other materials give similar results, the chief difference being in the slope of the curve.[3]

To determine the rate of softening of preforms during preheating, some interesting results have been found by using a penetrometer such as is employed in testing asphalt. Although the materials tested in preforms generally are rather heterogeneous, the results of pene-

[2] "High-speed plunger molding," by James Wilson, Canadian Plastics *3*, 16–17 (Nov. 1945).
[3] "Plasticity of molding compounds," by Robert Burns, MODERN PLASTICS *18*, 9, 72–74, 104 (May 1941).



4—Sketch showing one type of machine using steam preheater and loader for automatic transfer molding



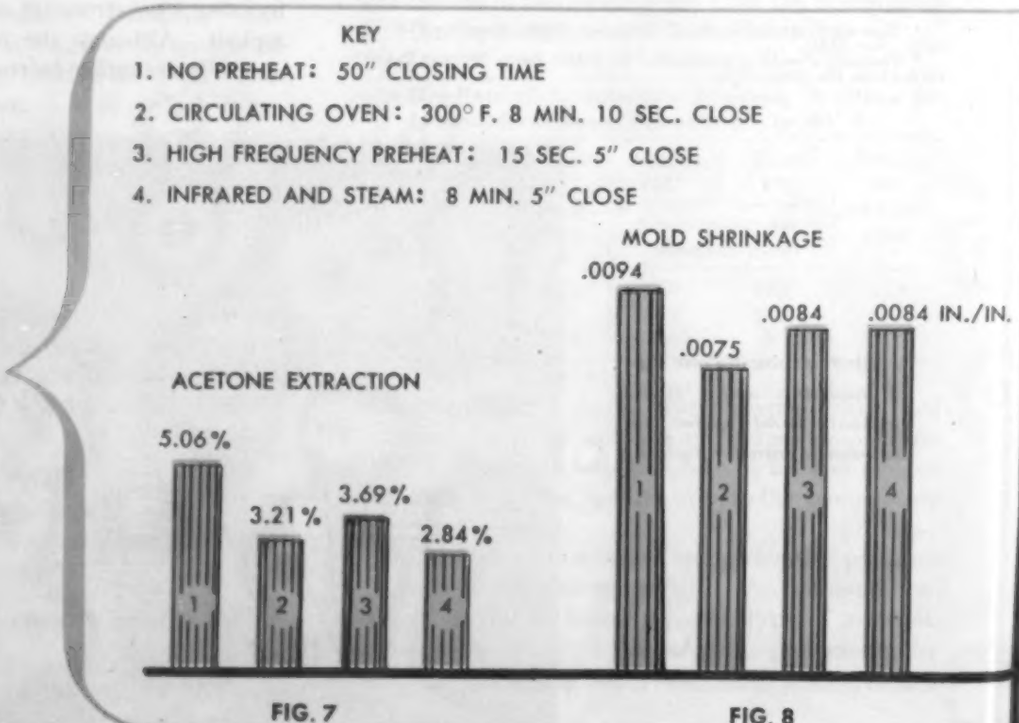
5 and 6—Acetone extraction after electronic and steam preheat. Left—Best transfer time. Right—Equal transfer time.

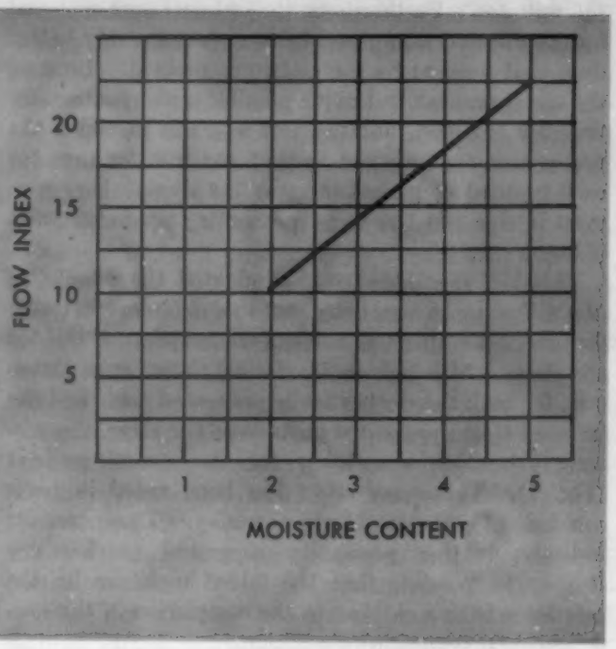
tration tests have been helpful in determining the proper time and temperature for preheating preforms for individual jobs.

The ability of steam or moisture to soften molding material makes possible the use of appreciably lower molding pressures. This, of course, is an important factor to consider in the economics of molding as both mold construction and maintenance costs, and press investment and maintenance may be reduced.

Besides the purely mechanical function of lubrication and its subsequent benefits to molding, there is another less understood effect of moisture in the molding operation which should be mentioned. With most forms of preheating it is very important to have the preheating time under close control. In a few instances this close control has also been found to be necessary to a degree in moist preheating. However, in a test specially run to determine how critical the time factor is in preheating for transfer molding, a steam moistened oven was set at 200° F. and loaded

7 through 11—Effect of preheat on acetone extraction, mold shrinkage, compressive strength, the flexural strength and the impact strength on compression molded test bars. All of the parts were cured for two minutes at 300° F.





12—*Effect of moisture on flow of phenolic molding powder*

with preforms. After preheating for $7^1/_2$ min. the preforms were removed singly and transfer molded at $1^1/_2$ min. intervals. The material transferred in from 14 to 23 sec. throughout the test which extended to $48^1/_2$ min. total preheat time. At the end of this time the oven was emptied of preforms and the test discontinued. However, it indicated that over this range of time the length of preheat time did not alter the transfer time. The variation in transfer time was not uniform due mostly to variations in the air pressure.

It has been suggested that the failure of the preforms to precure in such a long preheat might be due to the somewhat saturated atmosphere in the oven which prevented the drying out of the powder. As the chemical reaction involved is one which produces water as a by-product, it is conceivable that the equilibrium of the reaction is moved slightly toward the left due to the fact that the one by-product which normally escapes is kept in contact with reactants. Delayed cure effect becomes less noticeable as temperature increases.

In all early discussions of this matter of molding moistened powder, the following objections were invariably raised: "The moisture will make the parts shrink more and weaken them." "It will be necessary to cure the parts longer or to afterbake them." To answer these objections many tests have been run on molded parts to determine the actual facts.

To determine the speed of cure possible with this type of preheating, comparisons have been made on minimum cure time between the various methods of preheating. In addition, certain tests were limited to preheating with high-frequency and infrared steam in order to give a direct comparison. In every case, with transfer molded pieces varying from small thin sectioned parts to larger heavy sectioned parts, the infrared steam preheat produced parts which cured as fast or faster than the electronically preheated parts. In the few cases where the minimum cure times were identical, the electronically preheated parts produced larger blisters when the cure time was cut to a point just below the minimum cure point.

In tests run to determine the degree of cure versus transfer plus cure time, the infrared steam preheat accomplished a better cure (as determined by acetone extraction) in 30 sec. than did the electronic preheat in

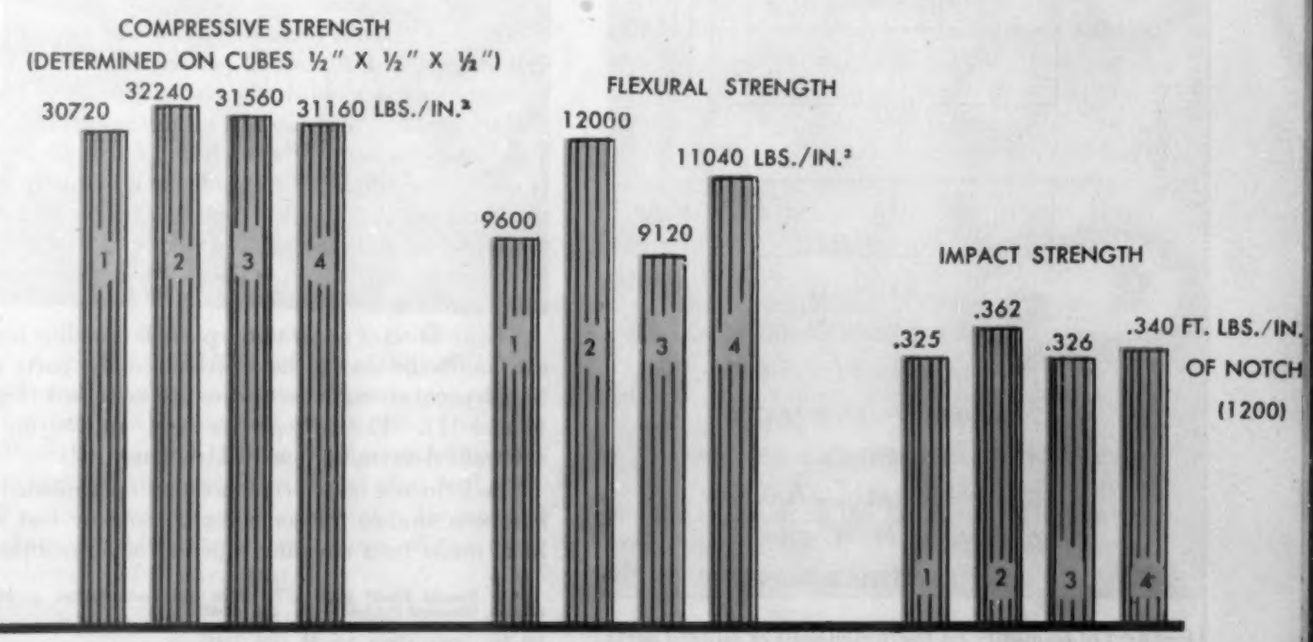
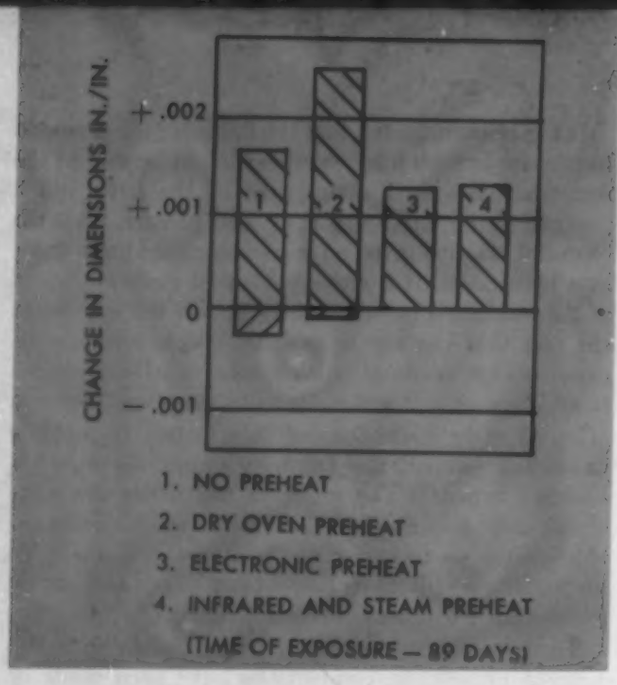


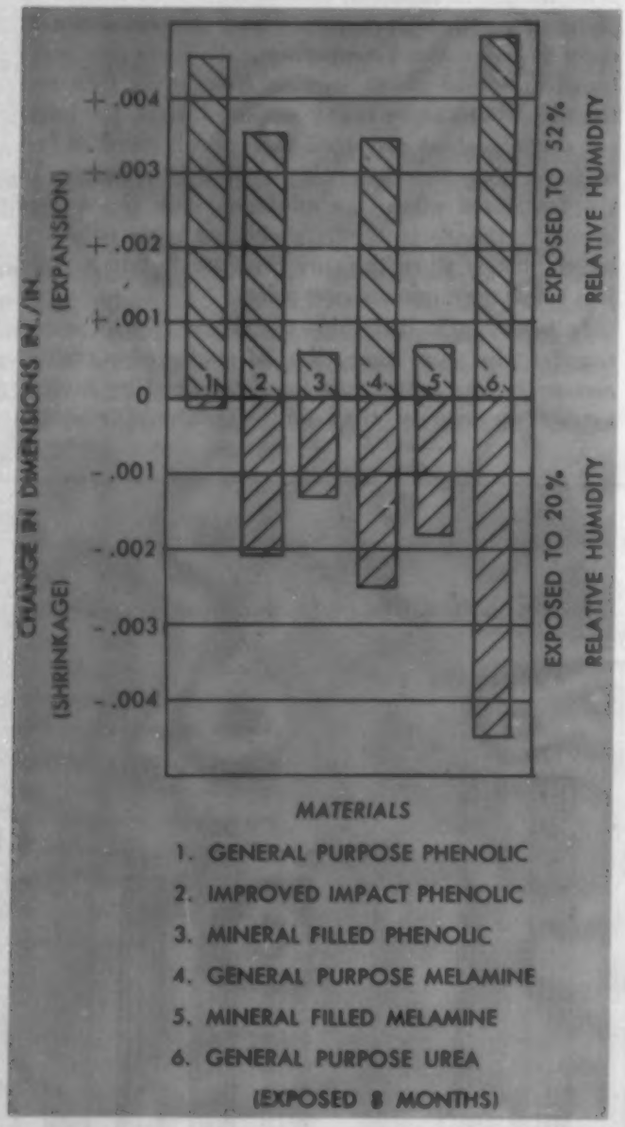
FIG. 9

FIG. 10

FIG. 11



13—*Phenolic (moisture 2.3%) preheated in four ways*



14—*Effect of humidity on the dimensions of molded parts*

1½ minutes. Furthermore, the ultimate cure achieved by the infrared steam preheat was considerably better than that reached by the electronic preheat. Because the moist preheat had made possible a shorter transfer time for this test, another test was run in which the preheating was adjusted so that the transfer time for each method of preheating was the same. However, even in this test the moist preheating produced parts of better cure (Figs. 5 and 6).

This last mentioned test eliminated the possibility of a difference in cure being due to a difference in transfer time. Another test was run on compression molded test bars. Although mold closing times, cure times, etc., for both the electronically preheated parts and the infrared steam preheated parts were the same, the acetone extraction was lower for the steam preheat (Fig. 7). This same effect has been noted in parts molded of asbestos-filled phenolics. These results indicate another possibility suggested previously—it may be possible that the added moisture in the powder acts as a catalyst in the completion of the condensation polymerization reaction.

It may also be that a small amount of volatile moisture may be trapped in each of Smekal's "Lockerstellen,"[4] creating a high pressure zone and thus driving that small volume of resin toward the right side of the condensation reaction. If this is done in each of the otherwise incompletely cured zones in the mass, it can be seen a more thoroughly cured part will be formed.

Although a rather thorough search of the chemical literature has been made, no reference has been found to the phenomenon of improved cure with added moisture. Thus it is hoped that additional work will indicate the answer to the problem of what actually occurs in this process.

The problem of shrinkage is one on which complete data is not yet available. On compression molded test bars the mold shrinkage of parts molded of powder preheated in a moist atmosphere was identical with that of electronically preheated parts (Fig. 8).

Bars stored at 20 and 52 percent relative humidity show that parts molded of moistened material have a slightly greater susceptibility to atmospheric changes. This seems to be true also of transfer molded parts. However, the difference in shrinkages is normally such a small amount that it would be negligible for all but the most critical dimensions. Further tests to determine dimensional stability over longer periods of time are being conducted.

The addition of water to the phenolic molding powder can hardly be said to have weakened the parts when the physical strength properties are examined (Figs. 9, 10 and 11). These properties have not, as yet, been determined on transfer molded test bars.

The influence of external moisture on a molded part has been studied for some time. Sokolov and Zarubina[5] made tests covering a period of 36 months and

[4] H. Ronald Fleck, Plastics, Scientific and Technological, p. 205, 2nd Edition, Chemical Publishing Co., Inc. (1945).
[5] A. D. Sokolov and N. S. Zarubina, Plasticheskie Massy, Sbornick Statei, 141–145 (1939); Chem. Abs. 35, 4515 (1941).

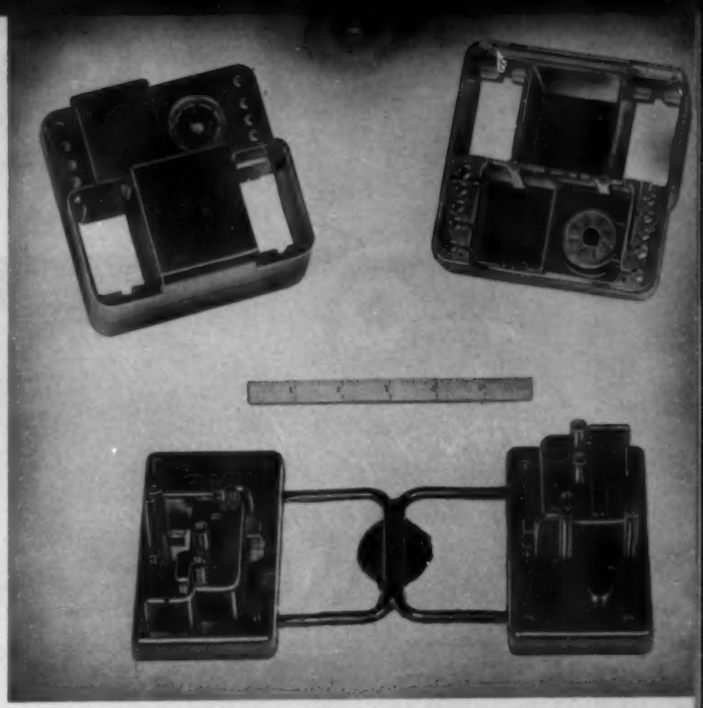
concluded that there is a definite limit of swelling and drying for each degree of humidity. For each degree there is an equilibrium at which no changes in size or weight take place. Thus, by selecting the initial moisture content of the powder, it is possible to produce articles that do not change in weight and size at the humidity to which the object will be subjected.

Using material of known moisture content the effect of various types of preheating on dimensional stability at humidities of 20 and 52 percent was determined (Fig. 13). Likewise using a variety of materials previously stored under the same conditions, the effect of exposure to 20 and 52 percent relative humidities on molded test bars was measured (Fig. 14).

At the present time sufficient evidence is at hand to indicate the value of moist preheating for general transfer and compression molding. The economy of this type of preheating is one of its chief values, and this will be more and more pronounced as the size of molded parts increases. It offers economically feasible possibilities for molding articles of unusually large size without either exorbitantly large presses or preheating equipment.

Already the process is being used to preheat 10-lb. charges of material for transfer molding of two complete toilet seats simultaneously (Fig. 3). The transfer time on this job is less than 30 sec., and the cure time is less than $3^1/_2$ minutes. The sections are $1^1/_8$ in. thick. With a compression mold for the same part, the mere introduction of steam into the preheating oven reduced the cure time from 9 to 6 minutes.

This use of steam makes extremely effective preheating available for practically all molding jobs.



15—*Typical examples of complicated parts which have been transfer molded with assistance of steam preheat*

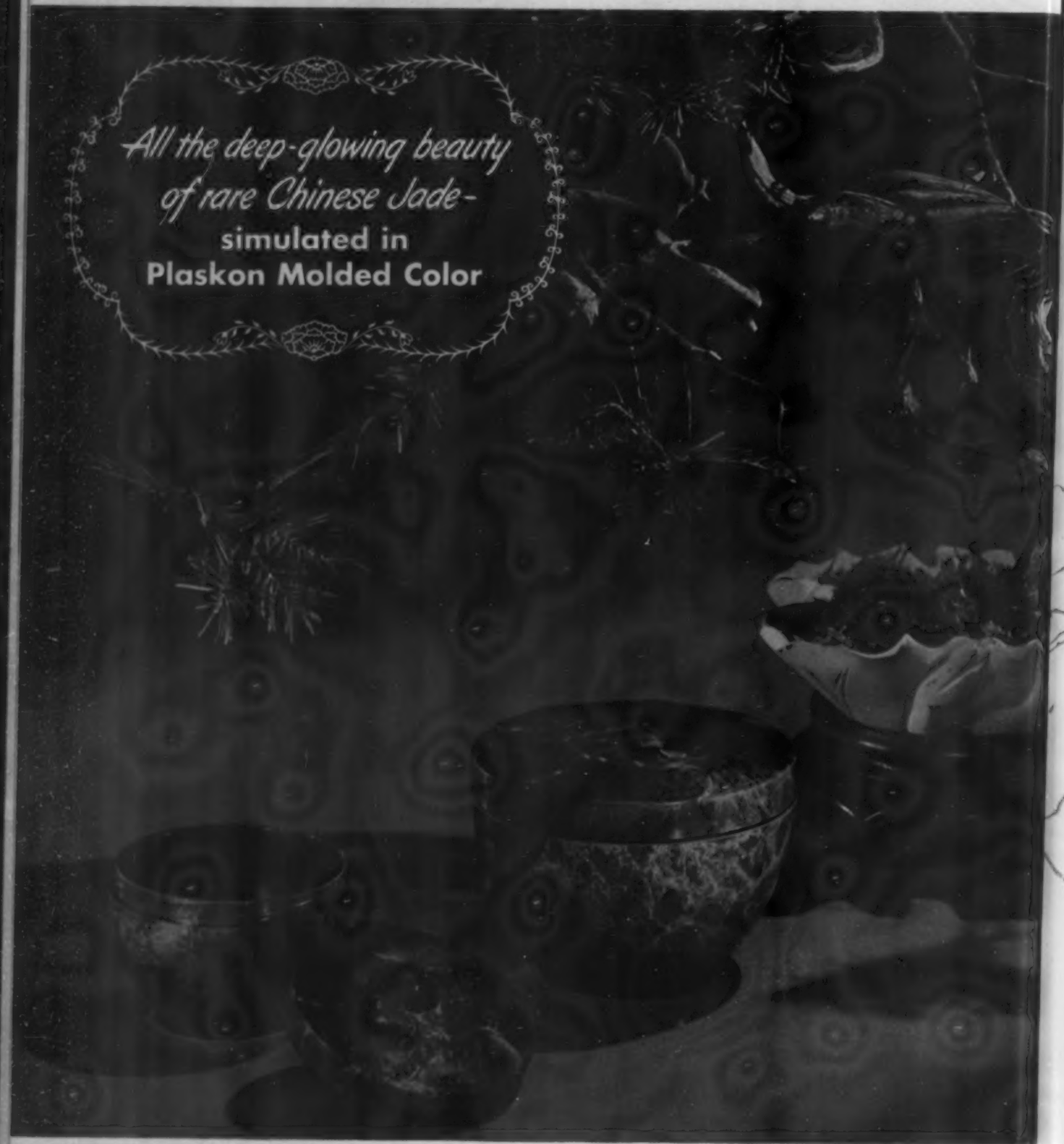
And this, in turn, makes possible much shorter cycles for the molding operations. Some finished parts are illustrated in Fig. 15.

In general, the evidence presented indicates that this is a method of preheating which, in spite of its simplicity and low cost, is an eminently suitable means of cutting molding costs without impairing the quality of the finished product appreciably.

A STREAMLINED PEN DESERVES A streamlined display. Perhaps this was the reasoning behind the selection of a molded Lucite or Plexiglas top and a Tenite II base for this container for the new Eberhard Faber ball-point fountain pen now on the market. Its concave shape provides interest and shows off the fountain pen to full advantage.

The box top is molded, rather than fabricated, from a heavy sheet of acrylic or methyl methacrylate. The base of the container is produced from pearl grey or ivory white cellulose acetate butyrate. Arnold Brilhart Co., Ltd., of Mineola, N. Y., has precision molded both parts of the case so that they fit together perfectly and are held together by friction alone. The clip which holds the pen is molded as an integral part of the base, the molder depending upon the strength and resiliency of the material to allow the pen to be snapped in and out. The pen name is dramatically presented on two sides of the cellulose acetate butyrate base in heat-stamped gold lettering.

The pen, encased in the box and held firmly by the clip is protected during transportation and display from dust and abrasion. The box has been found to be of great benefit in adverse weather conditions.


All the deep-glowing beauty
of rare Chinese Jade-
simulated in
Plaskon Molded Color

FEW COLORS in the world are more subtle, delicate and complex than those of real Chinese jade. And few are more difficult to simulate with man-made materials. Yet man has accomplished this task with the lustrous colors of Plaskon plastics, in the cream jars now being introduced by one of America's leading cosmetic manufacturers.

This is another outstanding illustration of how Plaskon Molded Color can serve dual needs in manufacturing and sales promotion. Plaskon molding compounds can be transformed into almost any distinctive, practical shape or size of product, in clear, brilliant tones that are uniform and permanent. The hard non-porous surface of molded Plaskon will not tarnish, check or corrode. It is completely impervious to the effects of alcohol, acetone or other common organic solvents. It is not affected by oils, fats, or greases.

Write for free illustrated book showing many uses of Plaskon* urea-formaldehyde and melamine-formaldehyde molding compounds in manufacturing and merchandising. Plaskon Division, Libbey-Owens-Ford Glass Company, 2121 Sylvan Avenue, Toledo, Ohio. In Canada: Canadian Industries, Ltd., Montreal, P.Q.

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PLASKON

TRADE MARK REGISTERED

MOLDED COLOR

Setting up a molding plant production

by D. A. DEARLE*

AS A RESULT of the tremendous volume of plastic business transacted during the past few years, both dies and presses, whether injection or compression, have been taxed to their productive limit and molders have had to face serious production problems. Apparently, this condition is due to prevail for quite some time. It therefore behooves the plastics production executive to maintain a systematic production schedule for all the presses in the plant in order to obtain the maximum output from both his molds and from his presses.

Why a production schedule?

As a rule, the compression and injection departments of a plastic molding plant are operated as two distinct units. This plan is highly advantageous from a production standpoint for it enables those concerned to keep track more easily of all raw materials, dies and maintenance work, and of all the accompanying records. Subdivision of the plant into two departments also permits the production manager to handle incoming orders more efficiently. Quite naturally this results, in most instances, in a marked improvement in the plant's service to the customer.

During normal times, a certain percentage of the equipment in a plastics molding plant is idle. Consequently, when a customer sends in an order for parts, he is usually given a reasonable delivery promise. But today, circumstances are different; when an order is received the production department has to do its utmost to find the available press capacity. Unless an

* Author, "Plastic Molding and Plant Management."

The advantage of this schedule is that it shows at a glance the order on which each press is working, type and quantity of parts, daily production, when work started and how long it has been running

PRODUCTION SCHEDULE

DESCRIPTION								YEAR 1946 WEEK ENDING					
PRESS NO.	NO. TONS	ARTICLE	CUSTOMER	ORDER NO.	QUAN.	DATE START	DAILY PROD.	SEPT. 14	SEPT. 21	SEPT. 28	OCT. 5	OCT. 12	OCT. 19
1	50	C-54 BASE	C.W. BARKER	1039	20M	9/9	2,000	———	———				
		C-55 HOUSING	M. HICKS	1056	5M		1,000			———			
		C-84 ROTOR	H. SCOTT & SON	1142	120M		5,000				———	———	———
2	200	C-88 CAP	DEE MFG. CO.	1283	500M	8/12	10,000	———	———	———	———	———	———
3	150	C-14 PLUG	C.W. BARKER	1040	80M	9/9	3,000	———	———	———	———		
		C-82 SLIDE	COPE & RYAN	984	50M		5,000					———	———
4	150	P-12 HANDLE	PROP.	STOCK	80M	9/2	4,000	———	———	———			
		P-13 BASE	PROP.	STOCK	80M		4,000				———	———	———
5	100	C-29 BOX	LEE CORP.	1102	10M	8/9	1,000	———	———				
		C-47 CAP	B. & E. CO.	1042	150M		5,000			———	———	———	———
6	200	P-29 TOGGLE	PROP.	STOCK	100M	8/26	3,000	———	———				
		C-30 LOOP	MOORE MFG.	982	24M		3,000			———	———	———	
7	100	C-31 RING	M. HICKS	1057	25M	9/9	1,000	———	———	———	———	———	
		C-83 BUTTON	ARTS INC.	1264	200M		5,000						———

schedule

A material reduction in the percentage of late deliveries and maximum output from both molds and presses are the benefits to be derived from a systematic production schedule

accurate system of scheduling has been put into effect, many promises on delivery dates are bound to be broken. Of course, even under normal operating conditions delivery promises cannot always be met due to the various unforeseen circumstances; but, a systematic production schedule can materially reduce the percentage of late deliveries.

A schedule built around a chart

The basis of this schedule is a chart which shows at a glance the size of the presses, the article being molded, the name of the customer, the order number, the quantity, the date the work started, the daily production and the weekly press production time. This chart should be supplemented by index cards for each press on which should be written all of the important details pertaining to the machine. These cards should include such information as the number of the press, its capacity in tons (if compression) or the number of ounces (if injection), the maximum allowable mold dimensions, ram travel, daylight, type of press and all other operating information.

In addition to having a card index file of the various presses, a similar record should be kept for each die. On the mold cards the following data should be listed:

Name of article	Gross weight of material
Overall size of die	Total land area
Number of cavities	Cycle time
Preforms or powder	Press tonnage required

Let us now look for a moment at a chart (Fig. 1) which illustrates an unfilled production schedule sheet for a hypothetical molding plant. It will be noted that the chart is made up for the compression molding department inasmuch as column two designates the capacity of the press in tons. The information in the first and second columns (press number and tonnage) is helpful in coordinating the production schedule data with that of the press card. It also makes it possible to see at a glance just which dies can be run in each press.

In the third column where the name of the article being molded is listed, the part number should also be noted so that there will be no confusion of items that have the same name. It is often advisable to place either the letter *C* or *P* in front of the part number to designate whether the item is produced from a customer owned die or from a proprietary mold.

The name of the customer and his corresponding order number are placed in columns four and five. This information serves as an excellent cross reference with the office records. The sixth column, under the heading *Quantity* (the total amount of parts required for the order on hand), is often referred to as production proceeds and compared with expected results. Column seven merely indicates the date on which molding operations started, information used in carrying over from one sheet to another. The anticipated daily production listed in the last column is usually given in units of a thousand. The quantities are either based on estimates or on past productive experience. The remaining spaces are used to designate the passage of time in weeks and, by filling in the dates on which the week ends, the sheet can be used for any desired time.

In the particular chart used to illustrate this story, only seven presses are listed; in practice a much larger sheet or series of sheets can be prepared to include as many machines as desired. Whether or not the presses are of the compression or injection type is immaterial inasmuch as the chart can be made applicable to either by merely changing the second column to read in ounces instead of tons. Of special interest is the opportunity this chart affords of obtaining a summation of the total goods on order. One month's schedule can thus be compared to another's to determine just how the back order situation stands.

A detailed analysis of the chart used to illustrate this article shows that fourteen items have been definitely scheduled for production. The presses in which the work is to be molded have been selected on the basis of satisfying the full pressure requirements of the dies assigned to them. The decision as to which presses to use with which dies is the result of coordinating information on the total land areas of dies and the tonnages required (data on mold cards) with press capacities.

Let us assume, for example, that Press No. 1 is a 50-ton machine while Press No. 2 has a capacity of 200 tons. Reference to the C-68 cap mold card discloses that the total land area is approximately 100 sq. in. and requires a total pressure of 200 tons. Under the circumstances, this die could not be placed in the first press.

This mold card also shows that the cycle time amounts to 3 min. and that there are 26 cavities in the die. With 26 cavities and a 3-min. cycle it does not take long to determine the expected production per day, which in this case amounts to 10,000 units.

Number of cycles per hour	20
Number of pieces per hour	520
Pieces per 24 hours	12,480
Down time, 20 percent off	9,984

Returning to the figures on the production sheet we

find that half a million C-68 caps are required to completely fill the order. On the basis of the figures given above it would take about 10 weeks of an uninterrupted run before the entire order would be completed. On the basis of these facts, the customer can be advised just when he can expect the goods and the approximate rate of production. In this particular instance, production started in August and was scheduled for completion by the latter part of October. This activity is represented in the right-hand columns of the chart by solid horizontal lines ending on October 19.

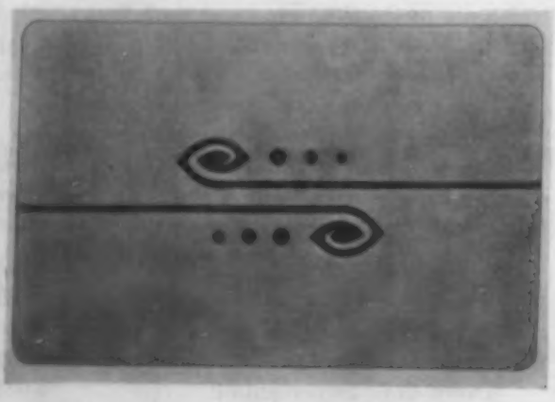
Reference to the proposed activity of Press No. 1 reveals a different situation entirely. Here we find that on the C-54 base there is a total order for 20,000 pieces. With an estimated daily production of 2000 parts, only two weeks are required to complete the entire order. This fact is represented on the right-hand side of the chart by the solid lines running for two weeks. Under the C-54 base we find listed the C-55 housing with a total order of only 5000 pieces. Inasmuch as 1000 of these parts can be made in a day, only one week is needed to fill the customer's requirements. Again, this fact is shown graphically by a heavy line running horizontally for one full week. Following this is an order for 120,000 C-84 rotors for H. Scott & Son. On this item the customer can be informed that the schedule as laid out calls for September 30 as the date on which production will start. He can also be advised to expect an average of 25,000 pieces a week, the order to be completed in approximately five weeks. In the chart it can be seen, too, that the press will be available for more work by about November 4. Likewise, we find that Press No. 3 will have completed its run by October 19 and that Press No. 6 will be available October 10. This graphical survey should be of particular interest to the sales department where future sales activity can be guided by the work that has to be molded.

While it is quite flexible, the chart should be constructed as a fixed plan of operation. Occasionally, however, the positioning of the horizontal lines may have to be changed to cope with unpredictable changes in the business. For example, let us say that the customer who buys the C-85 button (listed on the chart for Press No. 7) complains that a five-week promise is too long and requests a better delivery. Should such a request be found justified, then it might be possible to place the customer's die in Press No. 5 in place of the C-47 cap and start production in the week ending Sept. 28. A change as this would save over three weeks' time.

Another condition likely to arise is that of increases in the quantity of the original orders on hand. For instance, the chart shows an order for 5000 C-55 housings. If, however, an additional quantity should be requested before completion of the original order, then the production department faces the choice of extending the line or removing the die as originally planned. If the die is taken out of the press and the next item on the list molded, then the solid line for the C-55 housing could be started again by the first week in November. Mold changes are expensive, however, and the efficient plant manager will attempt to keep these non-productive labor operations at a minimum.

Each day brings forth new production problems and consequently any schedule has to be considered in the light of varying situations likely to arise. Without a definite plan or schedule of production, however, it would be very difficult for any molding plant, large or small, to successfully plot its future course of operation.

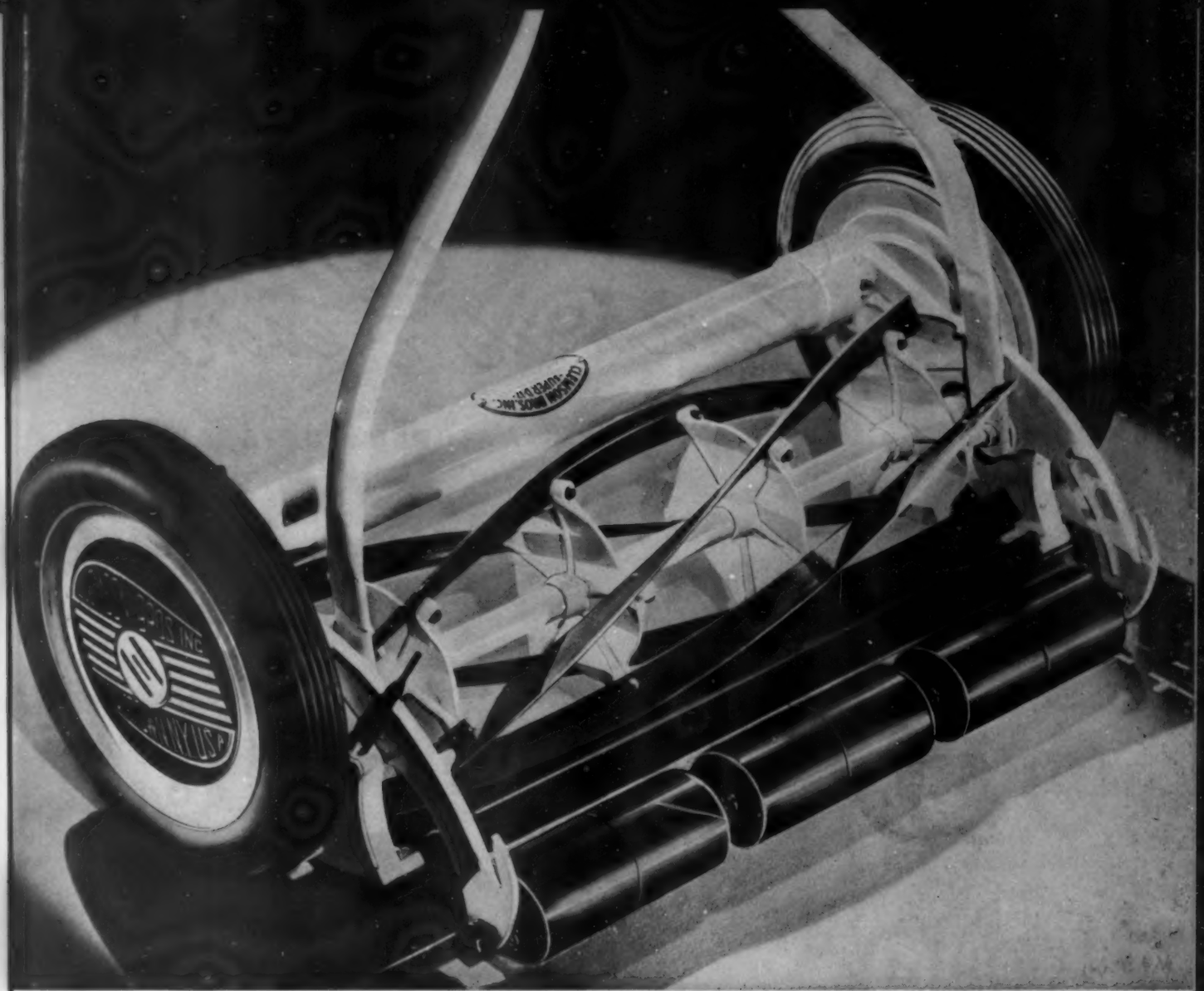
A PROCESS FOR REPRODUCING FOUR-color designs on high pressure laminated table tops has been developed by the Daystrom Corp., Olean, N. Y. This is considered a marked advance in decorated laminates for until recently four-color designs have been produced only by means of the expensive hand inlay methods.



The four-color process is continuous and the registry and color treatment is said to be as clear as that accomplished by the hand inlay method. With automatic reproduction, there is little difference in resulting costs between the conventional all-over printed patterns of one color as compared with the new four-color designs.

The Daystrom four-color decorated panels have been produced specifically for dinette and kitchen tables. Fabricating techniques are similar to those employed in laminating decorated plastic panels.

Many varied designs with linen and other background motifs are now being introduced by the company. These designs are non-objective, abstractions and highly stylized objects to conform with current decorative trends. Famous decorator designers have been employed in the development of the designs.



Clemson Super D-17 lawn mower manufactured by Clemson Bros., Inc.

New—with Rollers and Grips of TENITE

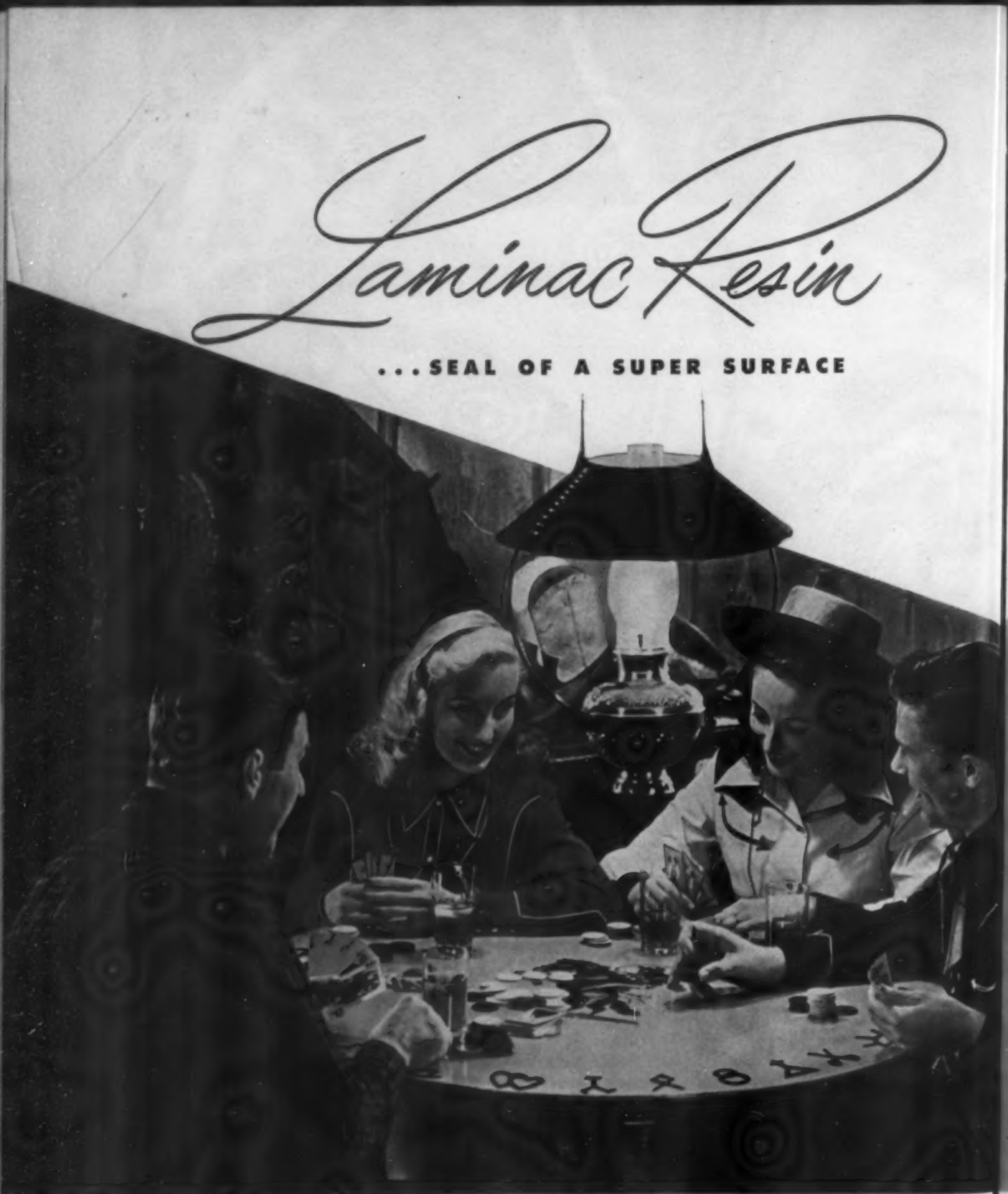
The three short Tenite rollers on this lawn mower make it easy to turn without damaging the sod. Each roller is molded in two hollow pieces which are cemented together. The uniformly tough plastic resists cracks under hard blows or moisture changes.

Smooth, palm-fitting Tenite grips are forced onto the ends of the tubular metal handle, where they are held securely by their own resilience. They are easy on the hands and add smartness to the general appearance.

Rollers and grips are black—though any color might have been chosen, since Tenite is available in an unlimited range of colors, transparent, translucent, or opaque. High luster is a characteristic of molded and extruded Tenite, and is derived from the polished cavities of the mold or the walls of the extruding die.

Further information concerning the properties and uses of Tenite will be supplied upon request. Write to TENNESSEE EASTMAN CORPORATION (Subsidiary of Eastman Kodak Company), KINGSPORT, TENNESSEE.

TENITE AN EASTMAN PLASTIC



Card room table top laminated with Cyanamid's LAMINAC resin by Laminating Specialties, Inc., Los Angeles, Calif.

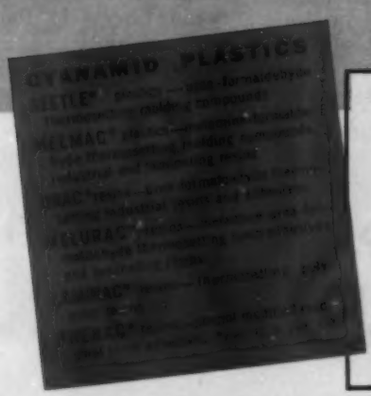
Here's *news* in architecture and furniture! Contact or low-pressure laminating resins are now being used for table tops, counter tops, and colorful surfaces for kitchen, dining room or playroom, restaurant or night club. These new surfaces for laminated walls, paneling, floor screens, venetian blinds, for home or office, are decorative, durable, colorful and easy to clean.

Laminated surfaces are actually layers of cloth, paper, glass cloth, or other "fabric" bonded together under heat and low pressure with Cyanamid's LAMINAC laminating resin. The pattern and color of the top layer show through the cured transparent LAMINAC resin like a picture through glass. Surface is smooth, hard, and glossy — resists scratching or marring — resistant to water, beverages, and many chemicals. Color and design are a permanent, integral part of the finished laminate. Can't rub off, fade, dissolve, or disintegrate.

It's easy to incorporate ideas for decorative detail, color harmony, functional design, in LAMINAC laminates. We shall be glad to send you complete details on this new laminating resin. American Cyanamid Company, Plastics Division, 32 Rockefeller Plaza, New York 20, N. Y.

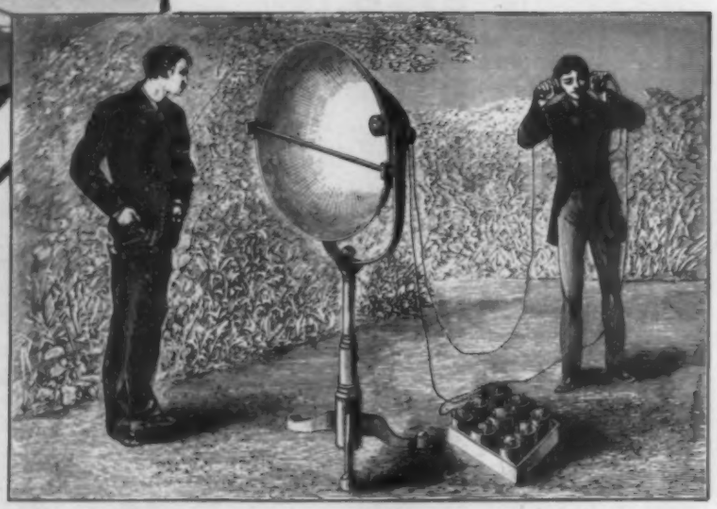
Right: This attractively designed tray, surfaced with a LAMINAC resin cloth laminate, provides the ultimate in beauty, durability and resistance to alcohol, fruit and food acids.

Below: Breakfast tables with colorful laminated tops that possess excellent resistance to heat, soiling and abrasion are among the recent applications of LAMINAC resin.



Cyanamid Plastics

Words that rode on a beam of light



If Alexander Graham Bell could look at the microwave antenna in the illustration, how quickly his mind would go back to his own experiments, 67 years ago!

For in 1880 the inventor of the telephone had another new idea. Speech could be carried by electric wires, as Bell had demonstrated to the world. Could it be carried also by a *light* beam?

He got together apparatus—a telephone transmitter, a parabolic reflector, a selenium cell connected to headphones—and "threw" a voice across several hundred yards by waves of visible light, electromagnetic waves of high frequency.

Bell's early experiment with the parabolic antenna and the use of light beams as carriers was for many years only a scientific novelty. His idea was far ahead of its time.

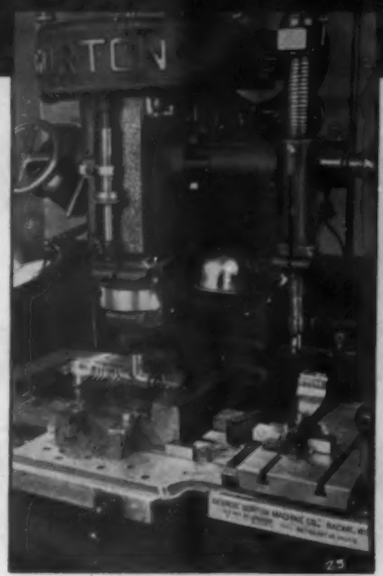
Sixty years later communication by means of a beam of radiation was achieved in a new form—beamed microwave radio. It was developed by Bell Telephone Laboratories for military communication and found important use in the European theater. In the Bell System it is giving service between places on the mainland and nearby islands and soon such beams will be put to work in the radio relay.

In retrospect, Bell's experiment illustrates once again the inquiring spirit of the Bell System.

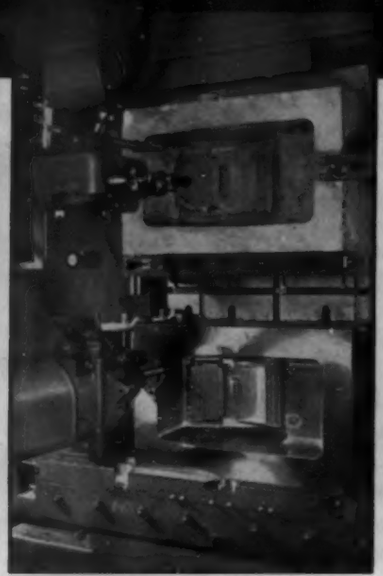
BELL TELEPHONE LABORATORIES

EXPLORING AND INVENTING, DEVISING AND PERFECTING FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE

WHERE ELSE WILL YOU FIND THIS COMBINATION?



1 Cavity section for a well-known radio cabinet being cut on our Gorton Duplicator.



2 One of our Pratt and Whitney Kellers cutting a cavity for an electric adding machine cover.

3 Cherrying handle portion of circuit breaker on our Kearney & Trecker Die Miller.

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Your shop foreman puts the stamp of approval on a Kline mold. He knows a Kline mold means clean, sharp products. That's the only way to get quick customer acceptance of a mold.

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You hear a lot about "know how." Kline has it, as do a number of others. But making a good mold also demands the most modern equipment. In many shops you'll find one of the machines illustrated. A few have two, but seldom will you find a shop with all.

A plastic product is only as good as its mold — that's why some of the biggest names in plastics use Kline molds. They specify Kline when a new product is added to the line.

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THE KLINE MANUFACTURING CO.

GALENA, OHIO

Dinnerware that's "ALL SET"

to wear... and wear... and wear!

Photo, courtesy of American Cyanamid Company. Table dishes, known as Devine Ware, molded for Devine Foods, Inc. out of Melmac—a plastic material compounded by American Cyanamid Co.

Restaurant and institutional dinnerware takes an awful beating . . . the stoutest china will crack and break under the strain of constant daily use. Here is dinnerware that is stronger than the heaviest china . . . chip-proof and virtually unbreakable, light in weight, colorful and styled in attractive, modern shapes . . . *Devine Ware*—made of plastic!

Devine Ware has the feel and appearance of fine china; and the amazing chemical and physical properties of a tough plastics resin—*Melmac*. Its rugged strength lies in the filler used—CLAREMONT chopped cotton fabric. This Claremont filler gives it the sinews that will make the end use of the formula wear . . . and wear . . . and wear.

You'll be all set, too, with whatever strength factors your compound requires when you select one of the Claremont fillers (available in four types: flock, thread, chopped fabric and cord). All are carefully graded, clean, uniform in size and processed to your special needs. A list of your specifications will bring you samples for laboratory test runs. Inquiries invited!

CLAREMONT
FLOCK
THREAD
FABRIC
CORD

THE FILLER IS THE HEART

CLAREMONT

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"The Country's Largest Manufacturer of Flock"

Wood treatment with urea resin-forming systems

(Comparison with phenolic resins for making compreg)

by M. A. MILLETT and A. J. STAMM*

SUMMARY

Matched panels of cottonwood veneer 1/16 in. thick were impregnated with urea-formalin, dimethylolurea and water-soluble phenolic resins, using solutions containing 25 percent solids by weight. Compressibility studies, made at pressures of 200, 400, 800, 1200 p.s.i. and temperatures of 212 and 310° F. on panels at two volatile contents, showed that, for any given compression, only about one-half the pressure was required for compressing wood treated with phenolic resin as was needed for compressing wood treated with urea resin. At the low volatile content required for making check-free high-density compreg, the urea resins precured to such an extent that they compressed with even more difficulty than did untreated wood.

Swelling and recovery from compression data obtained on matched parallel-laminated cottonwood compreg panels treated in the same manner as the compressibility panels and compressed at 300° F. for periods of 10, 20, 40, and 60 min. at pressures of 1500 to 2000 p.s.i. again showed the superiority of phenolic resins over urea resins for this application from the standpoint of dimensional stability.

RESIN-treated compressed wood (compreg) is made almost entirely with phenol-formaldehyde treating resins. Dimethylolurea or urea-formalin mixes have recently been suggested for use as the treating resin in place of phenol-formaldehyde because of their lower cost, reputed plasticizing action on wood and the fact that they discolor the wood less. A previous Forest Products Laboratory report[1] showed that water-soluble phenol-formaldehyde treating resins:

a) give a more dimensionally stable uncompressed product than dimethylolurea or urea-formalin mixes;

b) give the same dimensional stability with sufficiently less phenol-formaldehyde to offset the price advantage of dimethylolurea or a urea-formalin mix;

c) do not require the buffering to prevent precipitation of the resin in the treating bath that is necessary with dimethylolurea and urea-formalin systems.

Although these findings indicated that urea offers little if any advantage from the standpoint of costs and dimensional stabilization, it was felt desirable to test these urea resin-forming systems further to determine whether they have some special merit for making the compressed product. Comparative tests were hence made on the plasticizing action of the urea and phenolic resin-forming systems on wood under compreg manufacturing conditions, and on the swelling and recovery from compression of the compressed products.

In the production of compreg, the amount of compression obtained at any applied pressure, prior to cure, depends not only on the synthetic-resin content, species and specific gravity of the wood, but also on the volatile content of the material.[2,3] Previous experience with the phenolic resins had shown that the treated veneer must be dried to a volatile content below 5 percent, preferably around 2 percent, to insure the production of high-density compreg panels that will not check when exposed to low relative humidity.[3]

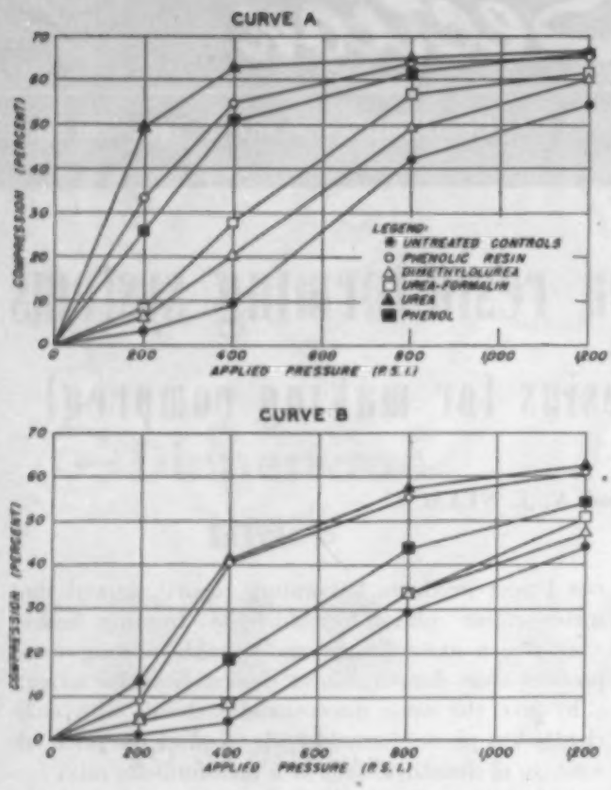
Drying to these low volatile contents necessitates drastic drying conditions and undoubtedly results in a significant amount of resin precure. Most phenolic resins, however, retain their plasticizing action under these conditions to a large extent. A comparative study of the influence of drying conditions on the compressi-

* Chemists, Forest Products Laboratory Service, U. S. Dept. of Agriculture, maintained at Madison 5, Wis., in cooperation with the University of Wisconsin.

[1] "Wood treatment with urea resin-forming systems—dimensional stability," by M. A. Millett and A. J. Stamm, MODERN PLASTICS, 24, 150–153, 202–206, (Oct. 1946).

[2] "Comparison of Commercial Water-soluble Phenol-formaldehyde Resinoids for Wood Impregnation," by H. K. Burr and A. J. Stamm, Forest Products Laboratory Report No. 1384 (1943).

[3] "Forest Products Laboratory Resin-treated Laminated Compressed Wood (Compreg)," Forest Products Laboratory Report No. 1381, revised (1944).



1—Comparison of the compressibility at various pressures of wood treated with urea, phenol, phenolic resin, dimethylolurea and urea-formalin resins, and having the higher volatile contents given in Table I. Curves A: Pressed at 310° F. Curves B: Pressed at 212° F.

bility of cottonwood veneer panels treated with urea-formalin, dimethylolurea and commercial phenol-formaldehyde resins was made to determine the relative compressibility of treated veneer under these imposed volatile content conditions.

Materials used

Cottonwood veneer sheets 1/18 in. thick, 28 in. wide and 54 in. long were cut into 7 by 7 in. sheets for compressibility panels and into 7 by 9 in. sheets for swelling and recovery panels. Panel matching was accomplished by uniformly distributing the sheets one at a time into as many groups as were to be used for panels.

Fresh commercial dimethylolurea, crystal urea, formalin and a representative water-soluble phenolic resin used for comparison were obtained from commercial producers.

The urea-formalin mix was made up in the proportions of two mols of formaldehyde to one mol of urea. The dimethylolurea was used without added urea. The urea-formalin and dimethylolurea solutions were buffered at pH 8 with a borax-boric acid buffer, conditions which had been previously shown to give optimum dimensional stabilization.[1]

Compressibility tests

The veneer was treated with urea-formalin, dimethylolurea and phenol-formaldehyde solutions containing 25 percent solids by soaking the air-dry sheets of veneer for 6 hr. to give a solution uptake of approximately 100 percent. Following a 1 to 3 day diffusion period in a closed container, one group of veneer was kiln dried for 16 hr. at 130° F., giving a volatile content of about 6 percent. The second group of veneer sheets was kiln dried for 16 hr. at 160° F., followed by 4 hr. at 170° F., giving a volatile content of about 2.5 percent. Untreated veneer for control panels for each group was dried under the same conditions. Table I shows the resin content based on the oven-dry untreated weight of the wood and the volatile content obtained by completely curing the resin in several test sheets of the two groups of panels in a hot press at 310° F. and under a negligible pressure for 30 min., with frequent breathing of the press.

After drying, the veneer sheets were trimmed to exactly 7 by 7 in. size and assembled into 7-ply cross-banded panels without addition of bonding resin. A total of 32 panels were prepared for each volatile content. One group of panels at each volatile content was pressed in a hot-plate press at 212° F. and pressures of 200, 400, 800 and 1200 p.s.i., with the temperature maintained for 15 min. followed by cooling. A second group of panels at each volatile content was pressed at 310° F. under the same conditions of pressure and time. The compression of each panel was measured by means of a dial gage attached to the press. Measurements were made when the panel was cold before and after pressing under a load of about 75 p.s.i.

Figure 1 shows the pressure-compressibility curves for the panels of approximately 6 percent volatile content at the two temperatures used. Figure 2 shows similar curves for the panels with about 2.5 percent volatile content. Included in Fig. 1 are curves for eight additional panels, half of which were treated with urea alone and half with phenol (*Please turn to page 208*)

Table I.—Resin and Volatile Content of Treated and Untreated Veneers Dried Under Two Sets of Drying Conditions[a]

	Dimethylolurea treatment		*Urea-formalin treatment*		*Phenolic resin treatment*		*No treatment*	
	Group 1	*Group 2*	*Group 1*	*Group 2*	*Group 1*	*Group 2*	*Group 1*	*Group 2*
Resin content, percent	21.9	21.6	27.1	17.6	27.1	25.1	0	0
Volatile content, percent	5.7	3.1	6.2	2.8	5.7	2.5	2.6	0.5

a The drying conditions were as follows:
Group 1: 16 hr. at 130° F
Group 2: 16 hr. at 160° F. plus 4 hr. at 170° F.

Condensation products of formaldehyde with amides and amines*

by DR. H. SCHEUERMANN†

THE scarcity of natural glue, phenolic resins and rosin, as well as the increasing utilization of wood wastes has resulted in a very urgent demand for suitable binding agents for use in the production of building boards from mechanical wood pulp or finely ground wood wastes and for the sizing of paper. For some purposes, the well-known urea-formaldehyde resins, especially Kaurit glue, can be used advantageously. But in other cases these products are unsuitable because the manufacturing process requires precipitable resin solutions or emulsions. Urea resins with these properties have been unknown up to this time. Although some precipitable urea resin emulsions (especially in conjunction with methyl ether) have been produced, their binding properties are not satisfactory.

It is obvious that precipitable urea resins might result if the urea resin itself could be given acid or alkaline characteristics. Alkaline urea resins as such are known, e.g., the product obtained according to Hassler's patent application by condensation of ammonium salts, formaldehyde and urea. However, these products are not precipitable. These experiments were extended and applied to other aldehydes. It was found that one could obtain resins which would be precipitated readily by alkalies or, especially, by alkali salts of resin acids if urea-formaldehyde resins are treated with acids or acid salts. Considerable amounts of acid ions are necessary, approximately 0.3 to 0.6 mol per nitrogen atom. Products with better precipitability are obtained through condensation of ammonium salts, formaldehyde, other aldehydes and urea. However, the gluing or sizing action of these basic resins is very poor after precipitation; satisfactory results can be obtained only by joint precipitation with alkali salts of phenolic resins or rosin.

Another means of obtaining precipitable urea resins is to incorporate into them compounds which contain both an acid group capable of salt formation and a radical, particularly the amino group, condensable with formaldehyde or methylol groups. Especially suitable are amino and urea carboxylic acids as well as phenolic carboxylic acids; the presently available aminosulfonic acids are unsuitable. The condensable carboxylic acids in amounts from 5 to 50 percent based on the weight of urea used for condensation, give products varying from highly viscous, gel-like glues to liquids of low viscosity, miscible with water in all proportions and easily precipitable with aluminum sulfate or acids. The precipitation products vary from resinous to mucilaginous to casein-like materials.

These products are not suitable alone for paper sizing, but they can be used together with rosin to conserve the supply of rosin. As glue for hot-pressed hard boards made of ground wood, addition of 4 to 8 percent of these resins, based on the ground wood, results in boards which are superior in breaking strength to those bonded with phenolic resins, but they do not comply with the requirements for water resistance. This disadvantage can be partly removed by addition of sodium soaps of fatty acids to the resin solutions and simultaneously precipitating resin, fatty acids on wood fiber.

A surprising observation during these experiments was that even when the condensation is carried to highly viscous, barely water-soluble products, not more than 65 percent of resin in the aqueous solution can be precipitated with aluminum sulfate or acids.

One great disadvantage of the aqueous condensation solution is its limited storage life. It is not possible to stabilize the condensation products for long storage.

When aminocarboxylic acids or, better, urea carboxylic acids are added during the Plastopal condensation, water-soluble to emulsifiable Plastopals are obtained, depending on the alcohols which are simultaneously condensed with them in the presence of alkalies. Melamine and melamine derivatives give the same results as urea.

In continuation of this work, sulfites, disulfites or their aldehyde derivatives were investigated as solubilizing components. The resulting products have remarkably good properties. They are well suited as sizing or finishing agents or as liquid glues and they have been used for these purposes. They can be further improved by additions of other condensable substances, such as amines, phenols, etc. In order to attain the desired water solubility with a high degree of condensation, about 20 percent of a sulfite, particularly an alkaline sulfite, based on the urea or the melamine, is necessary.

It is surprising that even with a mol ratio of 1 urea to 1 formaldehyde or 1 melamine to 1–2 formaldehyde products are obtained which are soluble in all proportions in water. According to observations thus far, the products are very stable. Thus, for the first time, it has

* This report was presented at the 26th Kuko (Plastics Committee) meeting in Frankfurt on Feb. 14,, 1943. It is PB 11428 of the Office of Technical Services, Dept. of Commerce. The translation was prepared by Mrs. I. G. Callomon and G. M. Kline, National Bureau of Standards.

† I. G. Farbenindustrie A.-G., Nitrogen Div., Op.

become possible to prepare a urea resin product very similar to natural glue. A 40 to 50 percent solution gives a solid gelatin-like product which melts readily at 60 to 70° C. and becomes solid again within 15 to 30 min. upon cooling. Like a hide glue, it swells slightly in cold water but is only difficultly soluble. According to tests, it is suitable as an adhesive for gummed tape and labels and is being used for these purposes in a somewhat more liquid form in Leverkusen in large quantities. According to our tests, it is superior to many products which are temporarily being used for this purpose. It is practically odorless and tasteless and does not contain free formaldehyde. It is also suitable as an extender for soaps, especially those made from fatty acids obtained by oxidation of paraffin. It is possible to add to the soap up to 40 percent of the resin without impairing the formation of lather. The irritation which usually occurs with these soaps is completely absent.

The Paper Laboratory in Ludwigshafen has discovered that products of this type are excellent for extending the supply of rosin soaps or the Hoechst sizing materials. Resinous solutions of these substances are perfectly miscible and, jointly precipitated with acids or aluminum sulfate, give good and economical sizing.

Recently, a urea derivative made with urea and glyoxal—namely, glyoxaldiureide (*Please turn to page 212*)

Spray polymerization of vinyl ethers*

by DRS. FIKENTSCHER, GAETH and SCHWAB†

FOR industrial production the vinyl ethers are polymerized on a commercial scale only by bulk or solution methods. The degree of polymerization is higher in bulk than in solution polymerization because of the higher concentration of the monomers. But the temperature of bulk polymerization cannot be kept low because it is difficult to remove the exothermic heat, especially in large batches. This results in bulk polymers which are more or less discolored and have a medium K-value. Although the purity of the ethers and the method of removing heat by worm-screw polymerization have been constantly improved, the K-value, for example, of vinyl isobutyl ether could not be increased to more than 60.

The application to the branched-chain vinyl ethers of the low temperature method used for polymerizing isobutylene (Oppanol B) produces a polyvinyl isobutyl ether (Oppanol C) with a K-value of 100 to 130. But the low temperature polymerization is limited to the branched-chain vinyl ethers and requires a large amount of a low-boiling solvent. Therefore, we searched for other ways to avoid temperature increase and discoloration. We found that this is possible by spraying the monomeric vinyl ether in finely dispersed form into a chamber that was filled with gaseous boron trifluoride.

The construction of the apparatus is simple and similar to a Nubilosa dryer. The gaseous borofluoride is mixed with dry nitrogen. The concentration of the catalyst used in the nitrogen at present is 5 to 10 percent depending on the type of vinyl ether. It seems advantageous to add a small amount of a low-boiling solvent to the monomeric vinyl ether. Since the solvent is not required to effect contact with the catalyst and since the removal of heat is very good on account of the large surface, the amount of solvent added is only about 25 to 50 percent, based on the vinyl ether. For this purpose we use vinyl chloride which does not participate in the polymerization.

Spray polymerization has the great advantage that the vinyl ether polymerizes in the form of very fine drops while falling freely. Thus excessive temperatures, which cannot be avoided in bulk polymerization, do not occur. The process is especially suitable for vinyl ethers which yield hard polymerization products, e.g., vinyl decalyl ether, vinyl cyclohexyl ether and vinyl camphene-carbinol ether. The products are obtained as fine, white, loose powders.

In our first laboratory tests we used a 20-liter tin plate container without bottom and a simple spray gun. At present pilot plant work is under way to determine the best manufacturing conditions. For spraying we use a slotted jet without aspirating outside air through this jet. The immediate removal of the polymer powder, which becomes discolored when exposed to the borofluoride atmosphere for some time, has not yet been solved for industrial production.

By this method we were able to produce vinyl decalyl ether as a white powder with a K-value of 51, whereas bulk polymerization yields a yellow resin with a K-value of only about 20. Because of this much higher degree of polymerization the polymer is no longer resinous but has the properties of an adhesive. It is compatible with oil and benzine and appears to be useful as a thickening agent for cable oils.

The objective of this investigation is to obtain by this new polymerization method polyvinyl ethers which have the degree of polymerization needed for plastics (K = 60 to 80).

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* This report was presented at the 25th Kuko (Plastics Committee) meeting in Frankfurt on Nov. 21–22, 1944. It is PB 11415 of the Office of Technical Services, Department of Commerce. The translation was prepared by Mrs. I. G. Callomon and G. M. Kline, National Bureau of Standards.

† I. G. Farbenindustrie A.-G.,

Photodielectric analysis of materials

by JOHN DELMONTE*

EXAMINATION of the dielectric breakdown phenomena in solid dielectrics prior to and at the time of failure has often been looked for as a desirable analytical procedure. But it is not a practical one due to the difficulty of making such a study. Work in this field has shown that transparent plastics afford an excellent medium for pursuing studies in solid dielectric materials due to the fact that certain of these plastics, when placed under a high voltage stress, will reveal, in polarized light, regions of dark and light fringes, analogous to the stresses and strains revealed in polarized light. And study of these light and dark fringes should prove of value in improving the design of high-voltage insulators. This type of examination should also be of value in theoretical studies on the volumetric insulation resistance of the plastics.

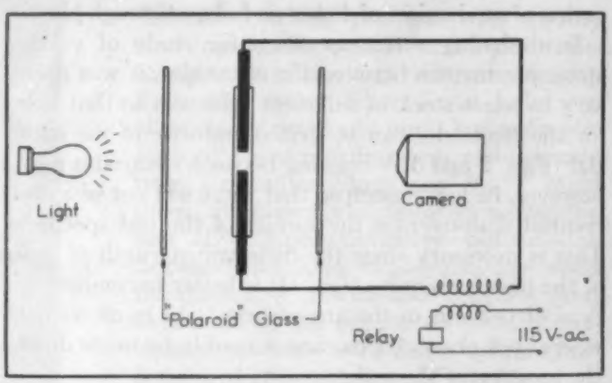
The technique of studying transparent plastics, which I developed at the Plastics Industries Technical Institute, is called *photodielectric analysis*. Aside from the electrical system, the optical portion of the set-up is quite similar to that employed in the photoelastic analysis of materials. A source of polarized light and a Polaroid viewing screen enable the observer to witness changes within the material as the voltage stress is being developed. A schematic illustration of the apparatus used in this study of transparent plastics appears in Fig. 1.

For observing dark and light fringes rather than a spread of the colors of the spectrum, a monochromatic source of light is preferred. This may be obtained by interposing a light filter between the light source and the polarizing film. Good results may be obtained with a filter which admits a band in the green portion of the spectrum.

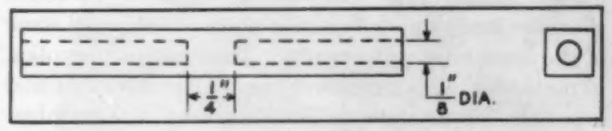
The voltage portion of the system follows conventional designs in employing a high-voltage test transformer, with voltage control exercised in the primary side by means of a Variac-type variable transformer. An over-current relay in the primary side interrupts the electrical circuit when dielectric failure takes place on the high voltage side. Some provision should be made for raising the voltage in precise steps, to allow photographing of the effects on the test specimens at the desired positions.

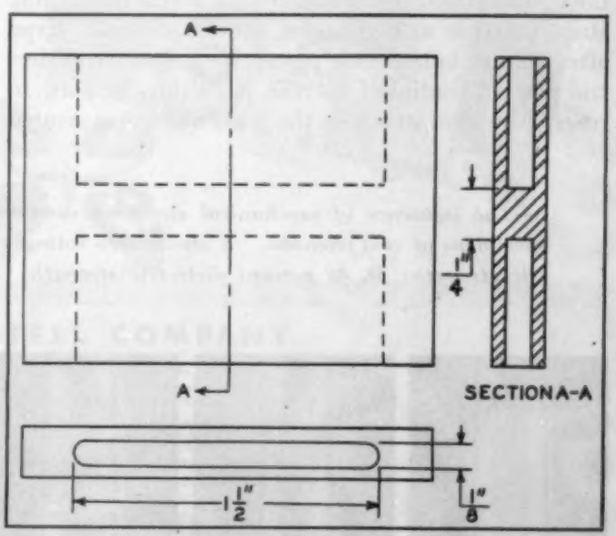
A second test method

An alternative test method is to apply a proof test voltage across the thickness of a sheet of plastic material rather than through the thickness of the material as shown in Fig. 1 and examine the results incident or normal to the surface. This study has also proved to be quite informative. As with the first method, this examination which is obtainable only with the aid of polarized light and transparent plastics, gives an indi-



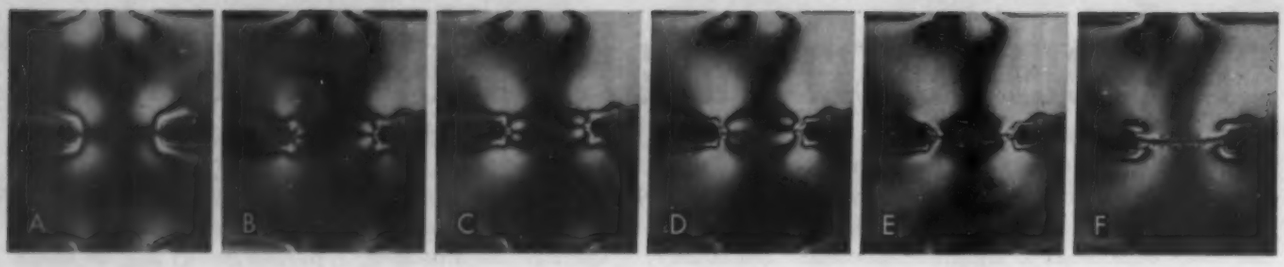
1—*A schematic illustration of the apparatus which is used in testing the voltage stress of transparent plastics*





2 (*top*), 3 (*bottom*)—*In designing test specimen for study of voltage stress, stock had to be thick enough to permit drilling of holes for electrodes end-wise of material*

* Technical director of the Plastics Industries Technical Institute, Los Angeles, California.



4—The start from zero voltage to complete failure is seen in this specimen of cast phenol-formaldehyde. A shows the start from zero voltage; B, 30 percent of rated dielectric strength; C, 63 percent of rated dielectric strength; D, 90 percent of rated dielectric strength; E, few seconds after failure; F, one min. later

cation of mechanism of dielectric failure through plastic.

In designing a test specimen for study of voltage stress phenomena between the electrodes, it was necessary to select stock of sufficient thickness so that holes for the electrodes can be drilled end-wise of the material (Figs. 2 and 3). Spacing between electrodes must, however, be low enough so that there will not be a preferential flash-over on the surface of the test specimen. This is necessary since the dielectric strength of some of the plastics is quite high. It is better to conduct this type of test out in the atmosphere than in an oil bath where spot observations cannot readily be made during the progress of the test.

Phenolics give best results

A number of transparent plastics were employed in this test, including polystyrene, cast phenolics, polymethyl methacrylate and cellulose acetate. Of these, the more stress-optically active phenolics afforded some of the more interesting results. Transparent phenolics, in particular, with a relatively high current leakage and low dielectric strength, permitted good visual examinations to be conducted, which readily revealed changing stress patterns with changing voltage stresses. Even after voltage failure took place, changes in the dielectric pattern continued to take place due, in part, to relief of internal strains as the heat, which was created by the passage of electric current, distributed itself to the mass of the test specimen.

In most of the tests, the machined samples of cast phenolic were annealed to relieve the internal strains and offer as stress-free a pattern to begin with as was possible. This was desirable because, as revealed in the series of photographs in Fig. 5, the presence of mechanical strains in the solid dielectric may direct the path of failure through the material. Another significant factor is the shape of the electrode endings in the transparent plastic, the most severe stresses appearing at the needle point type of electrode.

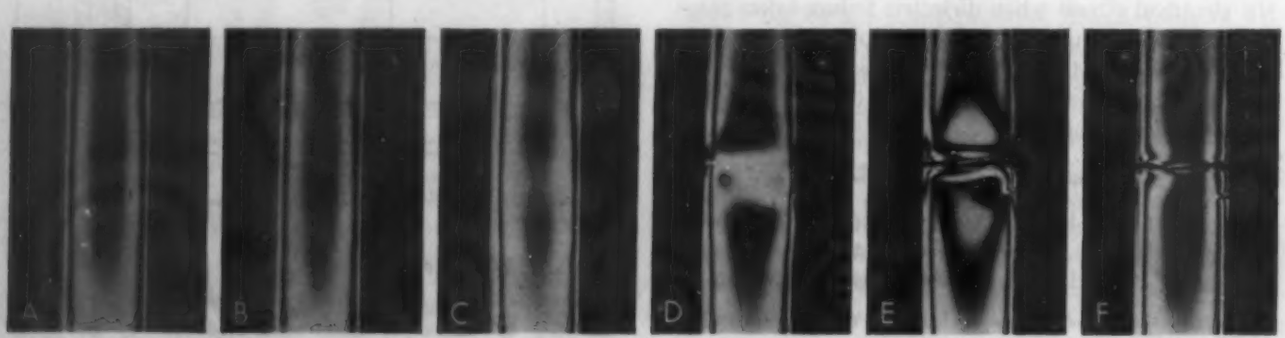
Pictorial results of tests

The material selected for the series of illustrations in Figs. 4, 5 and 7 was cast phenol-formaldehyde plastic material.

Figure 4—Six photographs showing the start from zero voltage to complete failure. Results are viewed across a gap of $^1/_4$ in. thickness. Particular note should be made of the fact that the relief of stress took place 1 min. after the failure.

Figure 5—Six photographs showing the initial voltage stress to final failure. These test specimens were not annealed as carefully as the first series and the influence of mechanical stress on the direction of dielectric failure can be observed. (*Please turn to page 214*)

5—The influence of mechanical stress on direction of the dielectric failure is illustrated in these test specimens of cast phenolic. A shows zero voltage; B, 75 percent dielectric strength; C, 80 percent dielectric strength; D, 85 percent dielectric strength; E, 95 percent dielectric strength; F, dielectric failure



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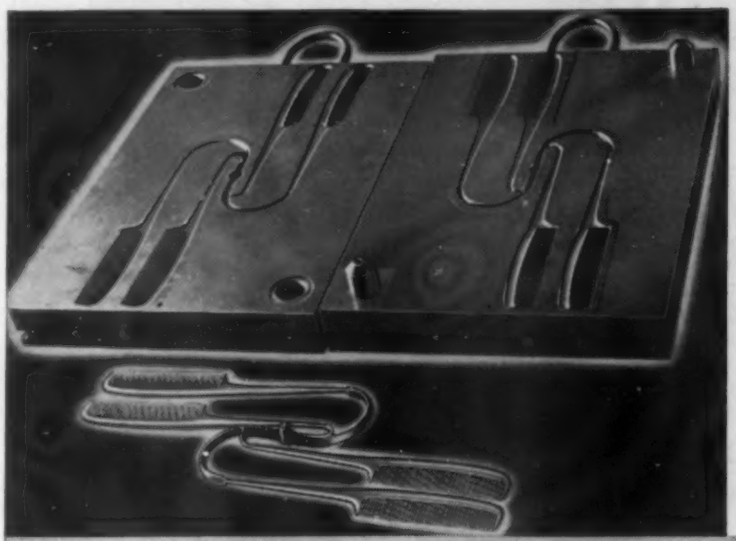

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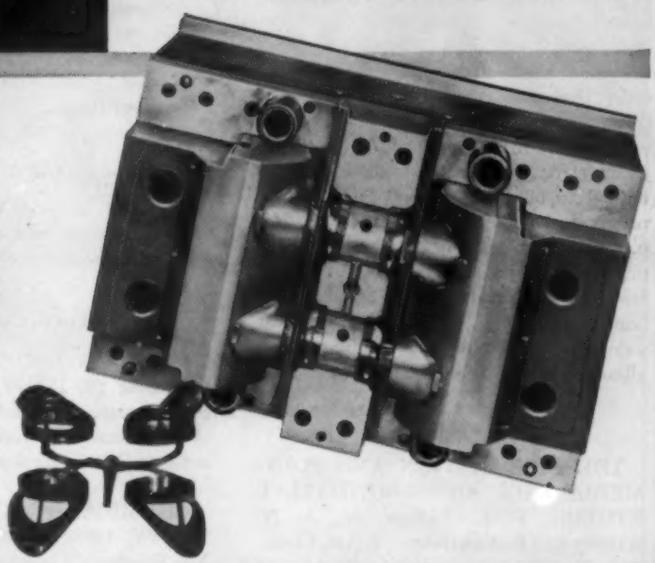

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Plastics Digest

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General

TERYLENE. Chem. & Ind. *1946*, 374 (Oct. 12). Terylene, a polyester resin synthesized essentially from terephthalic acid and ethylene glycol, was developed as a synthetic fiber. The properties of the fiber may be varied widely by the processing operations; for example, to obtain various strengths and extensibilities. Fibers of this resin are outstanding in resistance to heat and light, have a high initial modulus of elasticity, are highly resistant to micro-organisms, have good chemical resistance, are thermoplastic, have a high ratio of wet to dry strength, and have a low moisture absorption.

PEANUT-MEAL PLYWOOD GLUE. R. S. Burnett and E. D. Parker Trans. A.S.M.E. *68*, 751–6 (Oct. 1946). Specifications for peanut meal which is suitable for use in preparing plywood glues are given. The preparation of a peanut meal glue formulation which has good flow properties and which is satisfactory with bonding techniques ordinarily used for protein plywood glues is described The following results of tests on wood joints show that wood bonds made with the peanut meal glue meet the requirements established for casein glues: dry plywood shear strength from 327 to 553 p.s.i. with 9 to 50 percent wood failure; wet plywood shear strength from 91 to 260 p.s.i.; dry block shear strength 2857 p.s.i. with 13 percent wood failure. The lower strength values were obtained by bonding at 77° F. The higher strength values were obtained by adding blood albumin to the glue and bonding at 240° F.

Materials

THE PREPARATION AND POLYMERIZATION OF β-METHALLYL ETHERS. P. L. Nichols, Jr., A. N. Wrigley and E. Yanovsky. J. Am. Chem. Soc. *68*, 2020–2 (Oct. 1946). Eight new methallyl ethers of polyhydroxy compounds were prepared. Their rates of oxygen absorption are higher than those for corresponding allyl ethers and they absorb more oxygen at the gelation point. Comparative gelation times for allyl and methallyl ethers were determined. The mechanism of oxidation of methallyl ethers appears to be similar to that described for allyl ethers.

POLYTHENE. F. A. Freeth. British Plastics *18*, 444–6 (Oct. 1946). The history, preparation and properties of polyethylene are reviewed briefly.

POLYSTYRENE PLASTICS AS HIGH- FREQUENCY DIELECTRICS. A. von Hippel and L. G. Wesson. Ind. Eng. Chem. *38*, 1121–9 (Nov. 1946). The dielectric loss encountered in styrene monomer is analyzed, and the dipole moment of the styrene molecule is measured. A variety of polymerization conditions and the effect of moisture are investigated, and optical tests for the purity of the plastic are considered. The polystyrene produced is further modified by cross linking, copolymerization and hydrogen substitution; finally special filler materials of low loss are introduced which allow adjustment of the dielectric constant and thermal expansion coefficient over a wide range. Compositions of special usefulness are obtained by matching the thermal coefficient to that of metals. *p*-Divinylbenzene, divinyl sulfide and divinylacetylene were found to be cross-linking agents for styrene. Divinyl ether, diallyl sulfide, diallyl disulfide, sulfur, vinylnaphthalene, vinyl carbazole and vinyl cyanide produced linear copolymers with styrene. The dichlorostyrenes were also investigated. The fillers considered include glass, titanium dioxide, strontium titanate, silica aerogel, alumina and carbon.

SILICONES. L. Sanderson. British Plastics *18*, 459–64 (Oct. 1946). The types, properties and applications of the silicones are reviewed.

Applications

PLYWOOD COOPERAGE. Modern Packaging *20*, 114–15 (Oct. 1946). The construction, manufacture and properties of casks made of resin-bonded plywood in Great Britain are described.

CHEMICALS INCREASE VERSATILITY OF STARCH ADHESIVES. A. Frieden. Chemical Industries *59*, 641–4 (Oct. 1946). The manufacture of starch adhesives is discussed.

SERVE AND SELL. Modern Packaging *20*, 102–4, 174, 176 (Oct. 1946). Machine tools are packaged by dipping in hot-melt ethyl cellulose plastic for retail marketing.

PRODUCTION AND PROPERTIES OF PRESSED PERMANENT MAGNETS. S. Harris. Plastics (London) *10*, 534–41 (Oct. 1946). This is a translation of a German article by Dehler in Elektrotech. Z. *62*, 601 (1941). Moldable permanent magnetic compounds are made by mixing powdered magnetic alloys with either thermosetting or thermoplastic resins. With these compounds it is possible to produce shaped magnets more economically than by the usual metal casting and grinding operations. For some applications the magnetic energy of the molded magnet is only 25 percent less than that of the cast magnet of equal shape.

PROSTHESES COMPOUNDED OF VINYL MATERIALS SIMULATE SKIN, DISGUISE DISFIGUREMENT. Pacific Plastics *4*, 26–7 (July 1946). The manufacture of prostheses from vinyl plastics is described. The making of artificial breasts and face parts are used for purpose of illustration.

Coatings

ACTION OF ANTIFOULING PAINTS. B. H. Ketchum, J. D. Ferry and A. E. Burns, Jr. Ind. Eng. Chem. *38*, 931–6 (Sept. 1946). An antifouling paint containing rosin or other acidic resins in the matrix loses both toxic and matrix simultaneously when immersed in the sea. The loss of matrix is shown to be the result of the dissolution of acidic resin in the slightly alkaline sea water. A paint of this sort maintains a uniform and adequate leaching rate because the dissolving matrix gradually exposes stores of toxic which were originally deep within the paint film. The substitution of neutral resins which are insoluble in sea water, for rosin or other resins which are soluble, may decrease or destroy the ability of the paint to maintain adequate leaching rates. A theoretical description of the simultaneous dissolution of toxic and matrix is presented; the effects of surface residues of insoluble matrix components on the dissolution of the paint which operates by this mechanism depends on the loading of the toxic ingredient and the solution rate of the matrix. The opportunity of making independent adjustment of these two variables permits great flexibility in designing a paint with the desired leaching rate.

SOME DEVELOPMENTS IN CELLULOSE LACQUERS. R. J. Ledwith. J. Oil & Colour Chem. Assoc. *29*, 214–21 (Sept. 1946). The effect of various alkyd resins on the properties of a cellulose nitrate lacquer, hot-spray application technique and cellulose nitrate lacquers for coating metal disks for making recording blanks are discussed.

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Technical Briefs

Abstracts of articles on plastics in the world's scientific and engineering literature relating to properties and testing methods, or indicating significant trends and developments.

Engineering

SWOLLEN, IMPREGNATED AND COMPRESSED WOOD SAMPLES. G. L. Clark and J. A. Howsmon. Ind. Eng. Chem. *38*, 1257–62 (Dec. 1946). The swelling of wood and ramie fibers by pyridine and morpholine was studied. The agreement of calculated values of the lattice dimensions of the untreated and swelled specimens indicated that no compound formation between the cellulose and the molecules of the swelling agent had taken place. A comparison of the relative effectiveness of alcohol-soluble and water-soluble resins as impregnants was possible by this technique. The alcohol-soluble resins were more evenly distributed on the cell walls of the wood after preliminary swelling with morpholine than were water-soluble resins and, therefore, were probably more efficient in decreasing dimensional changes with changes in humidity. On the other hand, the water-soluble resins are more evenly distributed after vacuum treatment of the wood and impregnation under pressure.

MODERN THEORY AND PRACTICE IN SPECIALTY PAPERS. R. H. Mosher. Modern Packaging *19*, 137–40, 162 (Aug. 1946). The production of specialty papers by coating with plastic materials is discussed. The various techniques for applying coatings are given.

AMINOPLASTIC ADHESIVES. J. Hofton. Chem. & Ind. *1946*, 410–412 (Nov. 16). The properties and techniques of using urea-formaldehyde and melamine-formaldehyde adhesives are described in detail. The topics considered include plywood adhesives, constructional cements, extended adhesives, specifications, laboratory tests and service results as well as actual production.

Chemistry

SOME PRELIMINARY INVESTIGATIONS OF THE PHENOL-FORMALDEHYDE REACTION. T. T. Jones. J. Soc. Chem. Ind. *65*, 264–75 (Sept. 1946). The reaction between phenol and formaldehyde takes place as a series of step-wise reactions which are catalyzed by both acids and bases and which proceed under neutral conditions at sufficiently high temperatures. Two types of reaction take place: namely, the reaction of formaldehyde with phenol, or a phenolic molecule, to form phenolic alcohols containing reactive methylol groups and the subsequent condensation of these phenolic alcohols with phenol or a phenolic molecule to form larger molecules with elimination of water. Two studies of the initial portion of the reaction between phenol and formaldehyde in aqueous media are described: namely, the kinetics and the thermochemistry. Catalysis by different acids at the same pH values gives rise to similar rates of reaction especially when pH and rate of reaction are measured at the same temperature. This points to catalysis by the hydrogen ion. The second order rate law is best obeyed by all the curves relating to formaldehyde reacted and time at various pH values, at 100 and 80° C., using hydrochloric acid as catalyst. A decrease in temperature to 30° C. causes the rate law to approach first order. A theoretical inquiry shows that a decrease in order of reaction could be explained by the formation of dialcohols. In alkaline media, dialcohols also seem to be produced more readily, as indicated by the fact that a first order rate law is obeyed until about 45 percent of the formaldehyde has reacted. Thermochemical studies show that the heat evolved during the phenol-formaldehyde reaction may also be regarded as derived from the reaction of formaldehyde with a phenolic molecule and the subsequent elimination of water by condensation. The heats evolved per mol of formaldehyde reacted and water evolved are 4.1 and 16.9 kilocalories, respectively. These values are confirmed by combining heats of combustion and heats of mixing data.

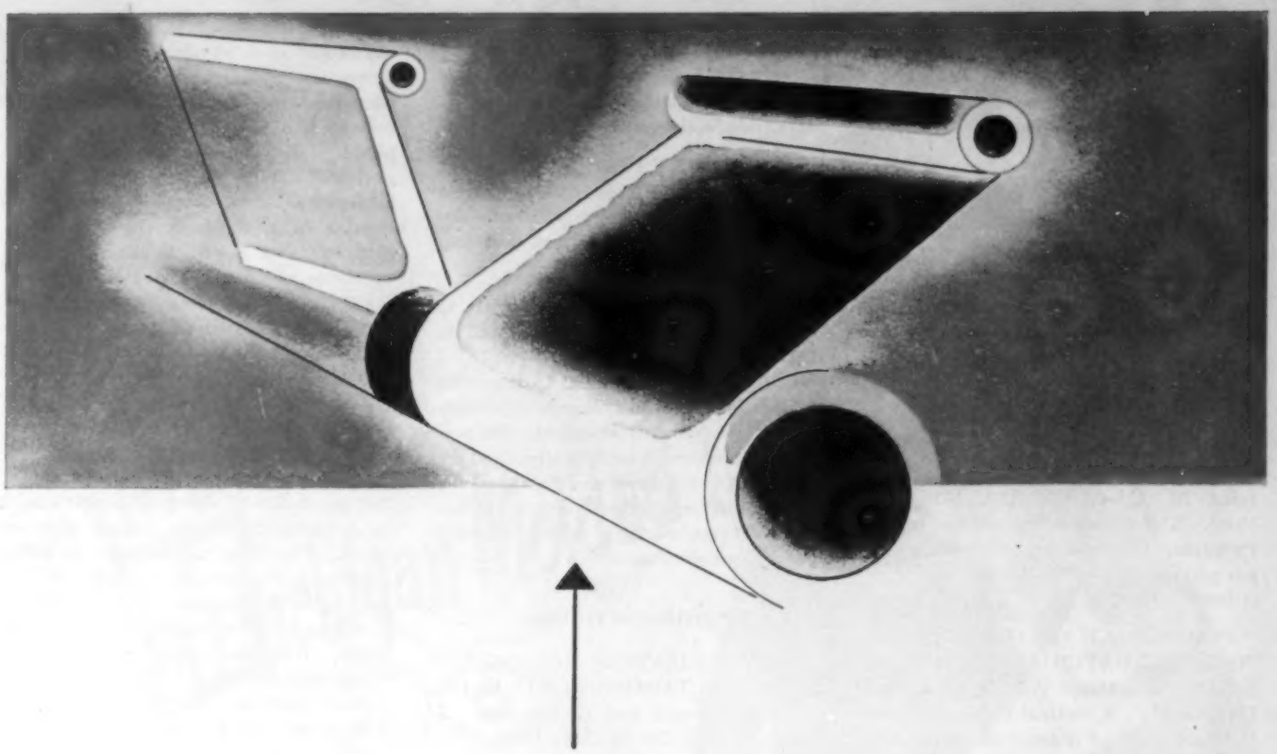
Properties

ELECTROKINETIC MEASUREMENTS WITH TEXTILE FIBERS AND AQUEOUS SOLUTIONS. S. M. Neale and R. H. Peters. Trans. Faraday Soc. *42*, 478–87 (June-July 1946). A technique is described for the measurement of the surface potential of fibrous non-conductors in aqueous solutions. It is shown that the variation of potential with concentration is, for neutral electrolytes, above 0.001 M concentration, in agreement with the theoretical principles described previously. For the amphoteric fibers—silk, wool and nylon—the surface potential below pH 6 is a linear function of pH and changes sign at about pH 3. For the neutral fibers—cotton, Vinyon and cellulose acetate—the surface potential decreases rapidly below pH 5, but there is no evidence for a reversal of charge. This is similar to the behavior of ethyl- and propyl-benzene in dilute acid solutions. It could be accounted for by a drift of electrons from liquid water toward the non-aqueous phase. Such a tendency would be repressed by the presence of excess protons in the aqueous phase. The adsorption of ions with specific affinity for the fibers causes marked changes in the surface potential values for wool and cotton.

CELLULAR PLASTIC HEAT INSULATORS. M. J. Hickman. British Plastics *18*, 439–43 (Oct. 1946). The properties of cellular cement, glass, rubber, hard rubber, glue, alginates, polyvinyl formal, phenol-formaldehyde resin, cresol-formaldehyde resin, polystyrene and chlorinated rubber are reported. Particular emphasis is placed on the thermal conductivity properties.

OSMOTIC PRESSURE MEASUREMENTS WITH POLYDIMETHYLSILICONE FRACTIONS. D. W. Scott. J. Am. Chem. Soc. *68*, 1877–9 (Oct. 1946). High molecular weight polydimethylsilicone was fractionated and the molecular weights of the fractions were determined by osmotic pressure measurements. The molecular weight of the fractions ranged from 290,000 to 2,800,000 for soft plastic to the elastic fractions, respectively.

GAS PERMEABILITY AND THE MICROSTRUCTURE OF POLYMERS. S. A. Reitlinger. Zhurnal Obshchei Khimii (J. Gen. Chem. U.S.S.R.) *14*, 420–7 (1944); Rubber Chem. & Tech. *19*, 385–91 (Apr. 1946). The relation between gas permeability and microstructure was investigated with hydrogen and films of natural rubber, polybutadiene, guttapercha, polychloroprene, butadiene-styrene copolymer, butadiene-acrylonitrile copolymer, polyethylene, polyisobutylene, polystyrene, polyvinyl acetate, polyvinyl chloride and polyvinyl alcohol. The permeability to gas of high molecular-weight polymers is closely connected with the character of the interaction between separate links of adjacent macromolecules, which is governed by the form of the chain and the energy of the intermolecular bonds. The magnitude of permeability increases with increases in the curvature of the principal-valence chains and in dimensions of the side groups, decreases with increase in the energy of the intermolecular bonds, and is independent of the length of the main valence chains. A comparison of the values of the activation energies and gas perme-



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abilities of a series of polymers makes reasonable the assumption that the principal paths for the penetration of hydrogen molecules lie along the interface between the nonpolar groups of the macromolecular chains.

Testing

WATER-VAPOR PERMEABILITY OF FILMS AT 100° F. Modern Packaging *19*, 146–7, 164, 166 (Aug. 1946). The standard test procedure of the Packaging Institute for measuring the water-vapor permeability of sheet materials at 100° F. is described.

GAS PERMEABILITY OF LOW-PERMEABILITY FILMS. Modern Packaging *20*, 151–2, 178, 180, 182 (Oct. 1946). The standard test method of the Packaging Institute for determining the gas permeability of low-permeability film is described.

FLASH-POINT OF ORGANIC INSULATING MATERIALS. M. Zürcher. Schweiz. Arch. angew. Wiss. Tech. *11*, 94–6 (Mar. 1945). A method for determining the flash point of organic insulating materials is described.

TERMINOLOGY OF WATER-VAPOR TRANSMISSION TESTING. C. A. Southwick, Jr. Modern Packaging *19*, 137–9, 172, 174 (July 1946). Water-vapor permeability is defined as the amount of water vapor passing through a given area of material under specified conditions of temperature and humidity. The term "water vapor" and the word "moisture" may be used interchangeably but it is incorrect to use the term "moisture vapor." Water-vapor permeability shall be expressed as grams per 100 sq. in. per 24 hr. at (specify) ° F. and (specify) relative humidity with (specify desiccant) used in the cup or as grams per 100 sq. in. per 24 hr. at (specify) ° F. and (specify) water-vapor pressure differential. Water-vapor permeability values shall be determined at 100° F. at a high vapor-pressure differential for materials which are to be used at temperatures from the freezing point of water to 120° F. Water-vapor permeability values shall be determined at 0° F. at high vapor-pressure differential for materials which are to be used at or below the freezing point of water. The results of one method of determining water-vapor permeability shall not be calculated or corrected into other temperatures or test conditions, although weight or area units may be corrected. A moistureproof material may be defined as one having water-vapor permeability of less than 1 gram per 100 sq. in. per 24 hr. at 100° F. at 40 mm. water-vapor pressure differential. A semi-moistureproof material may be defined as one having a water-vapor permeability from 1 to 3 grams per 100 sq. in. per 24 hr. at 100° F. at 40 mm. water-vapor pressure differential. Any material having a water-vapor permeability over 3 grams per 100 sq. in. per 24 hr. at 100° F. at 40 mm. water-vapor pressure differential shall be considered as having no effective moistureproofness.

BLOCK POINT TEST. Modern Packaging *20*, 147, 170 (Nov. 1946). A test method of the Packaging Institute for determining the blocking of sheet materials is described.

A FAILURE-SEQUENCE INDICATOR FOR STATIC TEST SPECIMENS. R. W. Powell. Trans. A.S.M.E. *68*, 763–6 (Oct. 1946). An instrument to determine the location of initial failure in static tensile-test specimens is described. Its particular usefulness in aircraft structural development is discussed and technical details of its operation are given. It has been used successfully to test sheet acrylic plastics and aluminum.

Synthetic rubber

POLYMERIZATION OF DIENES AND VINYL COMPOUNDS IN BULK. C. Koningsberger and G. Salomon. J. Polymer Sci. *1*, 200–16 (May 1946). The polymerization of dienes under the influence of heat, of diazoaminobenzene and of benzoyl peroxide was studied. Diazoaminobenzene probably acts as a slow but continuous source of free radicals giving quantitative yields of methyl rubber of good quality from dimethylbutadiene after a few days to a few weeks at 100–125° C. The effect of diazoaminobenzene on butadiene is the same, but the rate of the uncatalyzed dimerization of butadiene at 100° C. is as fast as that of dimethylbutadiene at 150° C. and, therefore, dimerization interferes much more strongly with the polymerization of butadiene. Only a 60 percent yield of polybutadiene was obtained. A few experiments with isoprene showed its position between the two other dienes. The effect of benzoyl peroxide on the polymerization of the dienes appeared to be much smaller than was expected from its known catalytic action on the polymerization of vinyl compounds. It is assumed that a larger number of radicals, produced by the fast decomposition of benzoylperoxide, causes this difference. Diazoaminobenzene has about the same effect on the polymerization of styrene and acrylonitrile as on that of the dienes. While methyl rubber and the polyisoprene resemble raw natural rubber, polybutadiene, prepared under comparable conditions, is hard, swells moderately and has a tendency to become brittle as a result of oxidation.

COMPARISON OF NATURAL AND SYNTHETIC HARD RUBBERS. G. G. Winspear, D. B. Herrmann, F. S. Malm and A. R. Kemp. Ind. Eng. Chem. *38*, 687–94 (July 1946). GR-S, nitrile and natural hard rubbers are compared with respect to compounding, processing, vulcanization and physical and dielectric properties. Natural rubber and GR-S compounds intermediate in sulfur content between hard and soft rubber are also compared. GR-S and nitrile rubber compositions suitable for commercial ebonite fabrication are described. Extensive breakdown of the basic copolymers has little effect on the physical properties of synthetic ebonites. The time required for the beginning of exothermic reaction in vulcanization is longer for GR-S than for natural rubber ebonites. Rockwell hardness is greater for GR-S. Some GR-S ebonites are penetrated to the same depth as natural ebonites, with a greater tendency toward instantaneous recovery. The two are similar in impact strength, but the ability to withstand a sharp bend is characteristic of the natural ebonites alone. The latter are superior to GR-S ebonites in heat deformation below 60° C., but above this temperature the reverse is true and nitrile ebonites are superior to both. GR-S ebonites are more stable and nitrile ebonites less stable chemically than natural ebonites. GR-S ebonite dust as a filler increases brittleness. A diatomaceous earth improves the processing properties of GR-S hard rubbers. The adverse effect of ultraviolet light on surface resistivity is reduced when a GR-S hard rubber is filled with whiting. Natural and GR-S hard rubbers are alike in dielectric behavior.

SODIUM-CATALYZED COPOLYMERIZATION OF 1,3-BUTADIENE AND STYRENE. C. S. Marvel, W. J. Bailey and G. E. Inskeep. J. Polymer Sci. *1*, 275–88 (Aug. 1946). A convenient laboratory procedure for the sodium-catalyzed copolymerization of butadiene and styrene is described. Earlier attempts to accomplish this probably failed because the monomers were not sufficiently pure. The copolymer of butadiene and styrene which results from sodium polymerization is different from the emulsion copolymer, GR-S, in several important respects. The sodium-catalyzed copolymer has a more nearly constant styrene content at different stages of conversion; it is made up of molecules with a relatively narrow molecular weight spread; it has a higher intrinsic viscosity; it is 100 percent soluble in benzene even at 100 percent conversion; when treated with standard rubber antioxidant, it ages better; and it has a greater amount of the butadiene joined in the 1,2 manner. The effects of such variables as temperature of polymerization, method of adding the monomer mixture to the catalyst, size of catalyst particles and possible butadiene impurities on the polymerization were studied. The method is extended to cover copolymerization of butadiene and *m*-methylstyrene to give a soluble copolymer of low molecular weight. Other styrene-type monomers gave less interesting copolymers.

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FIBER TREATMENT. J. B. Speakman and T. Barr (to Imperial Chemical Industries, Ltd.). U. S. 2,406,412, Aug. 27. Wool fibers are exposed at temperatures of 90 to 95° C. to the combined action of water vapor and the vapor of a polymerizable material such as acrylic acid, methacrylic esters, styrene or vinyl esters until a polymer is formed within the fibers.

FIBER TREATMENT. W. Charlton, S. G. Jarrett and E. E. Walker (to Imperial Chemical Industries Ltd.). U. S. 2,406,453–4, Aug. 27. Fibrous material is treated by applying an aqueous solution of persulfuric acid or a water-soluble persulfurate, exposing while moist to the vapor of a polymerizable vinyl compound in the further presence of a water-soluble oxy acid of sulfur or salt thereof having reducing properties.

ACRYLIC RESINS. H. T. Neumann (to L. G. Arpin and E. L. Symonds.). U. S. 2,406,558, Aug. 27. Scrap polymethyl methacrylate including cellulosic material is treated for 2 to 24 hr. in a solution of sodium sulfide, then for 2 to 3 hr. in a solution of sodium bisulfite, washed with water and finally dissolving in benzene.

POLYSILOXANE RESINS. J. Marsden (to General Electric Co.). U. S. 2,406,621, Aug. 27. Polysiloxane resins are prepared by dissolving a mixture of methyl chlorosilanes in an aromatic hydrocarbon solvent and slowly adding the mixture to a two-phase hydrolysis medium comprising an aliphatic alcohol, an aromatic hydrocarbon solvent and an aqueous solution of hydrochloric acid.

A COATING COMPOSITION. G. Witty. U. S. 2,406,649, Aug. 27. A liquid coating composition comprising cellulose acetate, toluenesulfonamide-formaldehyde resin, triphenyl phosphate and acetanilide, dissolved in a mixture of acetone, ethyl alcohol, ethyl lactate and triethyl citrate.

COATINGS. C. Bogin (to Commercial Solvents Corp.). U. S. 2,406,658, Aug. 27. Cellulose acetate plastics are coated with a coating comprising cellulose acetate butyrate dissolved in mixture of a hydrocarbon diluent, a lower nitroalkane and an aliphatic alcohol.

LAMINATE. H. W. Hall. U. S. 2,406,680, Aug. 27. A laminated article is prepared by applying a resin glue to surfaces of lignocellulosic material, assembling a number of laminations and immersing in a liquid such as paraffin heated above 212° F. until cured.

HEAT TREATMENT. H. A. Strickland, Jr. (to Budd Co.). U. S. 2,406,714, Aug. 27. A thermosetting plastic is heat-treated by subjecting different parts to alternating electrical stresses, the stresses being in some cases sufficient and in others insufficient to produce polymerization, whereby separate parts of the body are partially and also completely polymerized.

VINYL POLYMERS. C. A. Thomas (to Monsanto Chemical Co.). U. S. 2,406,717, Aug. 27. A copolymer of vinyl fluoride and a vinyl ester of a lower saturated fatty acid.

MOLD. D. P. Cooper, Jr. (to Polaroid Corp.). U. S. 2,406,742, Sept. 3. A mold for use in the formation of an optical element of polymerized synthetic resinous material.

POLYVINYL FLUORIDE. F. L. Johnston (to E. I. du Pont de Nemours & Co., Inc.) U. S. 2,406,837, Sept. 3. A composition which is stable at 225° C. comprising polyvinyl fluoride containing dicyclohexyl amine.

CELLULOSIC STRUCTURES. H. S. Rothrock (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,406,905, Sept. 3. Flexible regenerated cellulose pellicles in a highly swollen condition are passed through an aqueous bath containing a synthetic linear polymer at a pressure of 1 mm. of mercury.

GLAZING UNIT J. H. Boicey (to Libbey-Owens Ford Glass Co.). U. S. 2,406,939, Sept. 3. Laminated glazing unit.

RESIN STABILIZER. D. E. Adelson and H. Dannenberg (to Shell Development Co.). U. S. 2,407,051, Sept. 3. A stabilized resin composition containing a stabilizing amount of a mononuclear aryl hydroxy benzoate and a methyl isopropenyl ketone resin.

POLYVINYL ALCOHOL. J. Dahle (to Pro-phy-lac-tic Brush Co.). U. S. 2,407,061, Sept. 3. Shaped articles are prepared by reacting a monomeric acetal of a mono-aldehyde with a solid polyvinyl alcohol under anhydrous conditions in presence of a catalyst and aldehyde.

ACRYLIC RESINS. J. E. Smith (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,407,107, Sept. 3. A stable aqueous dispersion of a polymerized alkyl acrylate produced by the emulsion polymerization of the monomer dispersed in an aqueous solution of a partially saponified polyvinyl acetate containing a refined petroleum hydrocarbon.

RESIN. H. A. Bruson and G. B. Butler (to Rohm and Haas Co.). U. S. 2,407,131, Sept. 3. The polymerization product of an alkacrylic acid ester of trinitrophenyl ethyl alcohol.

ADHESIVES. T. Daur and W. Daniel (to Alien Property Custodian). U. S. 2,407,143, Sept. 3. A stable adhesive composition comprising phosphorous oxychloride-treated natural rubber dissolved in monomeric styrene and containing ethylamine as stabilizer.

SOUND RECORD. A. B. Savage (to Dow Chemical Co.). U. S. 2,407,179, Sept. 3. A sound record of the instantaneous recording type comprising ethyl cellulose plasticized with a lower ester of ricinoleic acid.

NITROCELLULOSE. D. R. Swan and J. M. Calhoun (to Eastman Kodak Co.). U. S. 2,407,209, Sept. 3. A photographic film base material consisting of nitrocellulose stabilized with a phenol such as *p*-tertiary butyl phenol, *p*-tertiary amyl phenol or *p*-hydroxy phenyl acetic acid.

MOLDING POWDER. C. L. Dixon (to Protectoseal Co.). U. S. 2,407,225, Sept. 10. A molding powder comprising a mixture of wheat flour, extracted pine wood pitch and a synthetic resin such as phenol- or urea-formaldehyde.

MOLD. M. Hyman, Jr. (to Polaroid Corp.). U. S. 2,407,280, Sept. 10. A mold for the formation of an optical prism of synthetic plastic material.

HARMONICA. F. H. Magnus (to International Plastic Harmonica Corp.). U. S. 2,407,312, Sept. 10. A plastic harmonica.

DIMETHYLOLUREA. C. S. Maxwell (to American Cyanamid Co.). U. S. 2,407,376, Sept. 10. A colloidal aqueous solution of a partially polymerized, negatively charged dimethylolurea or dimethylolthiourea.

RESIN. H. L. Gerhart (to Pittsburgh Plate Glass Co.). U. S. 2,407,413, Sept. 10. Clear, hard, strong plasticized res-

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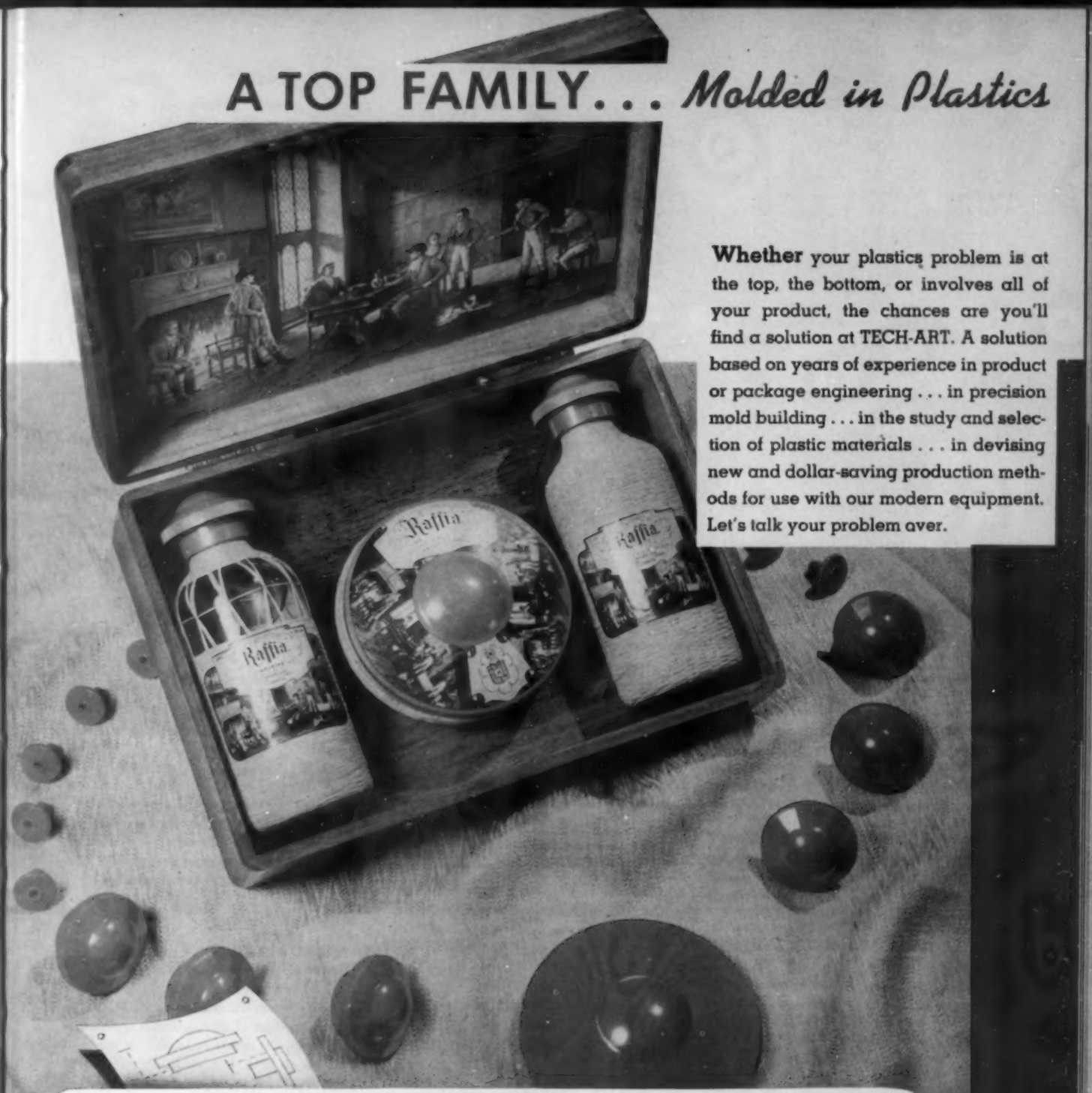

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Result? The low-cost saucy-looking top performers shown above — and another plastic success story by TECH-ART.

TECHNICAL NOTES: A urea plastic was the material finally selected because of its excellent color affinity.

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inous compositions are formed by admixing styrene, maleic acid and methyl levulinate, and polymerizing.

POLYMERS. M. A. Pollack (to Pittsburgh Plate Glass Co.). U. S. 2,407,446, Sept. 10. Polymers of unsaturated esters of carbonic acid.

POLYMERS. G. F. D'Alelio (to General Electric Co.). U. S. 2,407,479, Sept. 10. The interpolymerization product of a polymerizable unsaturated alkyd resin obtained by reacting a monohydric alcohol, a polyhydric alcohol and a plurality of polycarboxylic acids at least one of which is alpha unsaturated and a polymerizable alcohol polyester of an alpha unsaturated polycarboxylic acid.

POLYMERIZATION. H. Hart Vigsen (to Jasco, Inc.). U. S. 2,407,494, Sept. 10. An improvement in the low temperature polymerization of iso-olefins comprising turbulently agitating a cold liquid medium, containing the olefins, by a rotating member, the trailing edge of which delivers a fluid Friedel-Crafts polymerization catalyst to the liquid, thereby immediately forming solid polymer which is projected away from the zone of the catalyst.

INSOLES. L. B. High and G. C. T. Lindh (to Udylite Corp.). U. S. 2,407,495, Sept. 10. A plurality of sheets of thermoplastic material are welded along their edges by means of a hot gaseous blast, thereby forming an insole for a shoe.

EXTRUSION. W. A. Magerkurth and H. E. Buecken (to National Rubber Machinery Co.). U. S. 2,407,503, Sept. 10. A machine for the extrusion of thermoplastic materials.

DIELECTRIC SHAPES. G. Smolak (to Johns-Manville Corp.). U. S. 2,407,520, Sept. 10. A hard tough dielectric panel comprising asbestos fibers coated and bonded together with a heat-hardened phenol-aldehyde resin.

RESINS. R. W. Auten and J. L. Rainey (to Resinous Products and Chemical Co.). U. S. 2,407,599, Sept. 10. Thermosetting resinous products containing sulfonate groups are prepared by reacting an aldehyde; a salt of sulfurous acid; and a carbamide, a polyamino diazine or a polyamino triazine, at a temperature at which condensation occurs.

SCREEN. C. Dreyfus, U. S. 2,407,632, Sept. 17. A window screen comprising an open mesh fabric woven of threads of stretched organic acid cellulose esters or saponified esters and carrying a water-resistant cellulose derivative.

TOWLINE. R. C. du Pont (to All American Aviation, Inc.). U. S. 2,407,634, Sept. 17. A tapered towline for glider launching comprising a synthetic plastic material having high tensile strength, great percentage elongation and long elastic memory.

COATING. M. Leatherman. U. S. 2,407,668, Sept. 17. A fire-resistant coating comprising a polymeric material such as *n*-butyl methacrylate or the ethyl, methyl or propyl ester polymers of acrylic or methacrylic acids; a plasticizer such as tricresyl phosphate, triphenyl phosphate, dibutyl phthalate or a chlorinated diphenyl; a polymer such as polyvinyl chloride, or polyvinyl chloride-acetate copolymer, a solvent such as acetone, mineral spirit, xylol, butanol, ethanol, isobutanol, toluol, naphtha, or Stoddard solvent; zinc carbonate; inert pigment; and a fungicide.

PLYWOOD. H. J. Luth (to Brunswick-Balke-Collender Co.). U. S. 2,407,711, Sept. 17. A plywood article having concave form is produced by spreading plies with an adhesive, assembling, with the parts extending radially from a point on the form, compressing around the form and allowing to cure.

SOLENOID. H. J. Luth (to Brunswick-Balke-Collender Co.). U. S. 2,407,712, Sept. 17. A solenoid comprising a core, an insulated winding, means outside of winding and surrounding it comprising a sheet of material impregnated with a heat-setting resin, and a thin sheet of wound wood intermediate certain layers of the impregnated material and with its grain parallel to the axis, the assembly being heated to cause cure of the resin.

ALKYD RESINS. J. H. Perrine and H. L. Johnson (to Sun Oil Co.) U. S. 2,407,766, Sept. 17. An alkyd resin comprising the reaction product of four parts of a polycarboxylic acid, one to two parts of a polyhydric alcohol and one to four parts of a pentane-insoluble acidic material containing a carboxyl group, an hydroxyl group and a number of carbonyl groups.

SANDWICH MATERIAL. C. H. Buchanan (to Jicwood Ltd.). U. S. 2,407,867, Sept. 17. Curved composite material is produced by uniting an outer layer of plywood or metal to an expanded rubber core by means of a heat hardening resin, spreading the opposite core surface with the resin, applying another face ply to the coated surface, bending to the desired curvature, heating to cure the resin and removing pressure.

MOLDING MATERIAL. G. W. Whitehead (to Monsanto Chemical Co.). U. S. 2,407,943, Sept. 17. A polyvinyl acetal pressure molding composition having a decreased tendency to stick to molds due to inclusion of glycolic acid.

COPOLYMERS. E. C. Britton and W. J. LeFevre (to Dow Chemical Co.). U. S. 2,407,946, Sept. 17. In the copolymerization of vinyl compounds, the step of catalyzing the reaction by carrying it out in the presence of a peroxygen compound, a ferric salt of an inorganic acid, and an acid in an amount sufficient to give mixture a pH between about 1.5 and 3.

MOLDING. H. K. Nason (to Monsanto Chemical Co.). U. S. 2,407,962, Sept. 17. Thick masses of cellulose ester plastic are molded by heating the mold and the plastic to not over 150° F., raising the temperature of both above 150° F. by heating the mold at such a rate that a gradient of not over 30° F. is produced within the plastic mass.

CELLULOSE TREATMENT. C. Luckhaupt (to Luckite Processes, Inc.). U. S. 2,407,988–9, Sept. 24. Porous cellulosic material is impregnated by immersion in a mixture of terpene dihydrochloride and cellulose acetate heated to or above the melting point of the terpene dihydrochloride or in terebene and cellulose acetate heated to between 220 and 310° F.

POLYMERIZATION. R. M. Thomas and D. C. Field (to Jasco, Inc.). U.S. 2,408,007, Sept. 24. Improved polymers are obtained by polymerizing, at a temperature between −50° C. and −150° C., a mixture of isobutylene and a conjugated diolefin of 4 to 8 carbon atoms in the presence of a catalyst solution of aluminum chloride dissolved in an inert solvent, which is a liquid at such temperatures, to form a polymer containing occluded catalyst, bringing said polymer into contact with volatile hydrocarbon solvent containing an alcoholic catalyst quenching agent, thereby dissolving the polymer and destroying the activity of the catalyst, and finally washing to remove the aluminum compounds dissolved in the solution.

MOLDING COMPOSITION. D. W. Hansen (to A. E. Staley Manufacturing Co.). U. S. 2,408,065, Sept. 24. A plastic molding composition comprising a reaction product of starch and a melamine-formaldehyde condensate having a pH of 7 to 11.

VINYL COATINGS. G. H. Morey (to Commercial Solvents Corp.). U. S. 2,408,174, Sept. 24. A coating composition comprising a tough copolymer of vinyl chloride and vinyl acetate, a high boiling solvent comprising an alkyl ester of levulinic acid and a coal-tar hydrocarbon.

MOLD. Z. T. Walter. U. S. 2,408,245 Sept. 24. A plastic product is formed on a mold by superposing on the mold a waxed sheet, superposing thereon a sheet of absorbent material, and applying the plastic.

METHYL CELLULOSE. A. T. Maasberg (to Dow Chemical Co.). U. S. 2,408,326, Sept. 24. A fibrous cellulose of high alpha-cellulose content is treated by absorbing therein, at from 15 to 35° C., an aqueous alkali metal hydroxide solution,

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FROM now on, all types of the Eastman Kodak Company's cellulose-ester sheet... whether thick or thin... will be distributed under the trade name, Kodapak... the name formerly applied only to gauges .002″ and thinner. Kodapak will come in two forms: Kodapak I, cellulose acetate... and Kodapak II, cellulose acetate butyrate.

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- No. 150 (0.00150″)
- No. 200 (0.00200″)
- 3 thousandths (0.003″)
- 5 thousandths (0.005″)
- 7½ thousandths (0.0075″)
- 10 thousandths (0.010″)
- 15 thousandths (0.015″)
- 20 thousandths (0.020″)

Matte

- 3 thousandths (0.003″)
- 5 thousandths (0.005″)
- 7½ thousandths (0.0075″)
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Colored Translucent

- 3 thousandths (0.003″)

Currently available in white, ivory, peach, blue, green, pink, yellow, orchid, and gold.

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  - No. 120 (0.00120″)
- Black Kodapak
  - 7½ thousandths (0.0075″)

Kodapak II
(cellulose acetate butyrate)

Clear Transparent

- No. 90 (0.00090″)
- No. 110 (0.00110″)
- No. 130 (0.00130″)
- No. 160 (0.00160″)
- No. 200 (0.00200″)

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treating under autogenous pressure in a closed system at from 35 to 75° C. with a methyl halide and separating the water-insoluble methyl cellulose.

RESINS. W. L. Morgan (to Arnold, Hoffman & Co.). U. S. 2,408,332, Sept. 24. The process for the manufacture of water-soluble resinous condensates of boric acid and poly amino compounds.

PIGMENTED GEL. H. A. Toulmin, Jr. (to Chemical Developments Corp.). U. S. 2,408,353, Sept. 24. Cresol and formaldehyde are reacted for a time sufficient to cause reaction of all formaldehyde, water and free cresol are distilled off, fused resin is added, the mixture is heated until a homogeneous solution is produced, volatiles are driven off, glycerol is added together with a waterfree pigment treated with a dispersing agent and heating is continued at 500° F. until the glycerol has fully reacted.

POLYVINYL ALCOHOL. C. Dangelmajer (to Resistoflex Corp.). U. S. 2,408,377, Oct. 1. A normally flexible plasticized polyvinyl alcohol containing, as a thermostabilizing agent, a chloride of aluminum or tin.

COPOLYMERS. H. W. Arnold (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,408,402, Oct. 1. A copolymer of 13.8 percent trichloroethylene and 86.2 percent methyl methacrylate.

SEMICONDUCTOR. D. E. Edgar and D. J. Sullivan (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,408,416, Oct. 1. A semiconducting coating composition adapted for the manufacture of high-tension electric cables, comprising a resinous vehicle containing a non-drying oil modified alkyd resin, a polyvinyl acetal resin, a urea-formaldehyde resin and carbon black.

MODIFIED METHYL METHACRYLATE. F. L. Johnston (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,408,426, Oct. 1. A modified methyl methacrylate composition is prepared by polymerizing an aqueous dispersion of methyl methacrylate monomer in the presence of from 0.01 percent to 3 percent of trichloroethylene at a temperature of 100 to 150° C. under autogenous pressure.

LAMINATED GLASS. F. A. Rodman (to Libbey-Owens Ford Glass Co.). U. S. 2,408,483, Oct. 1. An integral laminated glazing unit comprising an inter layer of thermoplastic material and two surface sheets of glass.

FORMING. W. E. Williams. U. S. 2,408,540, Oct. 1. A scratch-resistant plastic article is prepared by forming a bath containing aluminum ethoxide, ethyl silicate, magnesium methoxide or magnesium ethoxide dissolved in xylol, methyl alcohol or anhydrous ethyl alcohol, placing a blank of the resin, containing sufficient water to react with the compound in the bath, between optically finished forming dies, placing the assembly in the bath, exerting pressure on the dies, heating to cause reaction such that a layer of the reaction product forms on the blank and also to form the mass into the desired shape, removing the assembly from the bath and drying and cooling.

RESINS. O. W. Cass (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,408,608–9, Oct. 1. A polymer obtained by the chlorination of a copolymer of vinyl chloride and vinylidene chloride or vinyl chloride and trichloroethylene.

CATION EXCHANGE RESINS. J. R. Dudley (to American Cyanamid Co.). U. S. 2,408,615, Oct. 1. A granular water-soluble composition comprising the reaction product of a mixture including furfural and material such as sulfuryl chloride or phosphorous oxychloride.

MOLDING. L. B. Green. U. S. 2,408,630, Oct. 1. A device for producing molded articles from thermosetting resinous materials.

POLYVINYL ALCOHOL. C. A. Porter (to Resistoflex Corp.). U. S. 2,408,682, Oct. 1. A composite product is prepared by treating a fibrous material with a linear ethylene amine and thereafter applying polyvinyl alcohol.

POLYMERIZATION. R. B. Seymour (to Monsanto Chemical Co.). U. S. 2,408,690, Oct. 1. A polymerizable vinyl aromatic compound is polymerized by dissolving, prior to complete polymerization, a minor proportion of sodium oleyl sulfate and oleyl alcohol and then completely polymerizing in a mold to form a solid polymer.

POLYVINYL CHLORIDES. M. L. A. Fluchaire (to Alien Property Custodian). U. S. 2,408,769, Oct. 8. A solution of polyvinyl chloride in cyclopentanone or methyl-cyclopentanone.

VARNISH. L. R. J. Kientz (to Alien Property Custodian). U. S. 2,408,782, Oct. 8. A baking varnish is prepared by resinifying phenol and formaldehyde in the presence of ammonia and tartaric acid decanting the resin, diluting with a mixture of acetone and butanol, and mixing with a solution of coumarone resin in benzene.

MOLDING MACHINE. A. A. Burry (to Cyril Fuller). U. S. 2,408,911, Oct. 8. A plastic molding machine.

RESINS. W. O. Kenyon and D. D. Reynolds (to Eastman Kodak Co.). U. S. 2,409,126, Oct. 8. Polymerized N-(alpha-methacrylyl)-*dl*-alpha-amino-phenyl acetic acid ethyl ester.

EYESHIELD. D. P. Bernheim and M. M. Glasberg (to American Optical Co.) U. S. 2,409,243, Oct. 15. An eye protection device comprising a main shield portion of plastic material.

POLYMERIZATION. J. W. Brooks, A. A. O'Kelly and R. H. Work (to Socony-Vacuum Oil Co., Inc.). U. S. 2,409,247–8, Oct. 15. The process of polymerizing olefinic hydrocarbons comprising establishing a reaction zone; reacting outside said zone anhydrous hydrofluoric acid with phosphorus pentoxide and thereafter contacting in the reaction zone with the definic hydrocarbons under polymerization conditions including temperatures between 0 and 60° C., olefinic hydrocarbons are polymerized by contacting with catalytic agents such as monofluorophosphoric acid and difluorophosphoric acid at temperatures between 32 and 140° F. and at a pressure sufficient to maintain the hydrocarbons in the liquid phase.

CONTAINER. T. S. Carswell (to Monsanto Chemical Co.). U. S. 2,409,252, Oct. 15. A self-sealing gasoline container having walls comprising a layer of rubber-impregnated rayon, a layer of latex, a layer of vulcanized rubber, another layer of latex and an inner layer comprising a plasticized sheet of polyvinyl formal resin.

RESINS. M. T. Harvey (to Harvel Research Corp.). U. S. 2,409,276, Oct. 15. A gel formed by heating together a blown terpenic product with a polyvinyl ester.

TUBE COUPLING. J. L. Hudson. U. S. 2,409,283, Oct. 15. A coupling comprising a tube element of plastic material, a terminal piece or fitting of plastic material, one element being constructed to receive telescopically the other, and a connection between the interfacing telescoping surfaces comprising a cement of plastic material unitable with other plastic members.

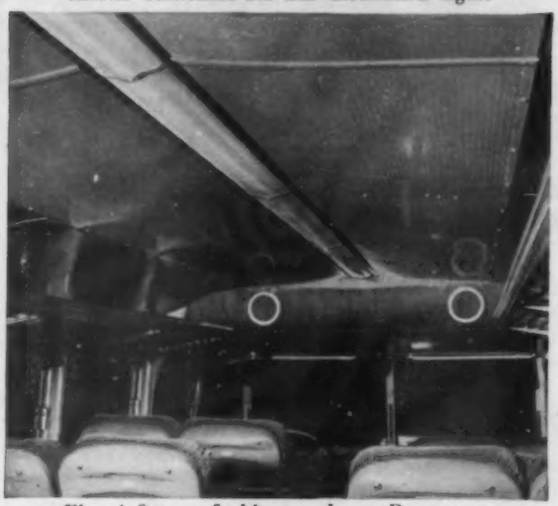
RESIN. H. C. Woodruff. U. S. 2,409,332, Oct. 15. A terpenic resinous acid ester compound of pentaerythritol-glycerol ether-alcohol.

BRUSH-SETTING. C. Jobst (to Toledo Automatic Brush Machine Co.). U. S. 2,409,490, Oct. 15. A brush backing of a polymeric material having a bore therein and a bristle tuft within the bore, an anchor formed of a vinyl chloride-acetate copolymer and having the ends laterally expanded to be embedded in the walls of bore and bonded to brush backing.

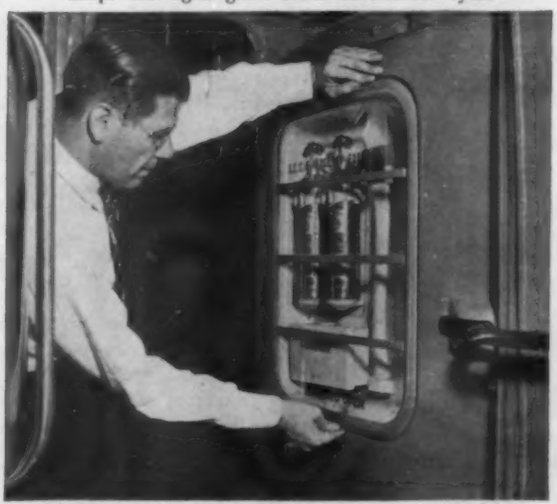
EXTRUSION. R. M. Wiley (to Dow Chemical Co.). U. S. 2,409,521, Oct. 15. In the extrusion of vinylidene chloride polymer there is introduced into and mixed therewith the vapor of a volatile chlorinated lower aliphatic hydrocarbon in small amounts such that the partial pressure of said chlorinated hydrocarbon is below the atmospheric pressure at the extrusion temperature.

BUOYANT CABLE. H. L. Beede (to Okonite-Callender Cable Co., Inc.). U. S.

PLEXIGLAS combines brilliance and clarity with shatter-resistance for bus destination signs.



Electric fixture of white translucent PLEXIGLAS keeps the light glare from customers' eyes.



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2,409,529, Oct. 15. A buoyant electric cable comprising the combination of a number of hermetically sealed plastic center members or cells braced internally with transversely extending wooden disks, spacers between adjacent cylinders, a conductor stranded about said cells and spacers, and an enclosing non-metallic, water-impervious, flexible sheath, the weight to volume ratio of the composite being such as to allow flotation in sea water.

POLYVINYL ACETAL. M. O. Debacher (to Monsanto Chemical Co.). U. S. 2,409,548, Oct. 15. A composition comprising a polyvinyl acetal resin and a partial ester of a polyhydric alcohol and a saturated monocarboxylic aliphatic acid, the polyhydric alcohol residue containing two unreacted hydroxyl groups.

TRANSFER MATERIAL. W. Heinecke and F. Heinecke (to Di-Noc Manufacturing Co.). U. S. 2,409,564, Oct. 15. A composite transfer sheet comprising in combination a bottom base sheet of paper, a sheet of ethyl cellulose, a photosensitive layer and a top sheet of a vinyl resin.

POLYMERS. E. L. Kropa (to American Cyanamid Co.). U. S. 2,409,633, Oct. 22. A polymerizable composition containing an unsaturated alkyd resin, triallyl phosphate, and copolymerization catalyst.

RESIN-FIBER ARTICLE. E. E. Sawyet (to Canal National Bank of Portland). U. S. 2,409,645, Oct. 22. A fibrous laminated article comprising a compacted and bonded assembly of superimposed interfelted fibrous layers and resin hardened and integrated under pressure, alternating layers of said article containing high and low resin contents, respectively.

COPOLYMERS. W. E. Hanford and J. R. Roland (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,409,679, Oct. 22. A polymer of ethylene and methyl alpha-chloroacrylate.

LAMINATING FABRIC. A. Lyem (to Celanese Corp. of America). U. S. 2,409,703–4, Oct. 22. A laminating fabric is prepared by applying to a fabric containing yarns of a thermoplastic organic derivative of cellulose and non-thermoplastic yarns an aqueous dispersion of triethyl citrate or a plasticizing mixture containing plasticizer for the thermoplastic yarns, whereby a major portion of the plasticizer is absorbed by the thermoplastic yarns.

MOLDING. J. B. Whitmore, W. Makenny and F. A. Newcombe (to Westinghouse Electric Corp.). U. S. 2,409,725, Oct. 22. An apparatus for automatically molding plastic materials.

MILK CARTON CASE. L. C. Folst (to Edgewick Investment Co.). U. S. 2,409,748, Oct. 22. A smooth unitary splinterless plastic case for waxed paper milk cartons.

RESIN. M. J. Scott (to Monsanto Chemical Co.). U. S. 2,409,906, Oct. 22. A composition comprising the heat reaction product of an aminotriazine aldehyde addition product and a primary mono-amino-diphenyl free from aldehyde reactive substances.

RESINOUS FOAMS. K. E. Stober (to Dow Chemical Co.). U. S. 2,409,910, Oct. 22. A container is filled with a cellular mass of a solid resin by introducing at super-atmospheric pressure into the container a granular vinyl aromatic resin, introducing a normally gaseous agent capable of solution in the resin to swell the latter to a gel, maintaining super-atmospheric pressure until gelation occurs, and thereafter venting vapors from an upper section of the container to cause formation of the cellular mass within the above-mentioned container.

POLYMERS. E. L. Martin (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,409,948, Oct. 22. A composition comprising the copolymerization product of a mixture of a perhaloethylene containing at least two fluorine atoms, vinyl fluoride and a hydrogen-containing halogenated ethylene other than vinyl fluoride.

PRISMS. H. G. Rogers and D. P. Cooper, Jr. (to Polaroid Corp.). U. S. 2,409,958, Oct. 22. An optical element is prepared by rapidly securing together a plurality of mold parts so arranged as to be removable from a securing frame, introducing a flowable polymerizable mass into the mold, advancing the polymerization of the mass to a hard partially polymerized material which adheres to the mold parts, removing the object with the attached mold parts from the securing frame and advancing the polymerization of the mass to substantial completion.

ARCH SUPPORT. W. M. Scholl. U. S. 2,409,960, Oct. 22. An arch support comprising a rigid member of hard plastic material.

COATINGS. M. Salo (to Eastman Kodak Co.). U. S. 2,409,985–6, Oct. 22. A non-blocking melt coating composition, adapted to give coatings of low moisture vapor permeability, consisting of a heat stable butyric acid ester of cellulose, di-2-ethylhexyl phthalate or castor oil, a wax, and a blending agent for the wax, and a blending agent for the wax comprising a pentaerythritol ester of rosin or a rosin-maleic acid glycerol resin.

ETHYLENE POLYMERS. M. J. Roedel (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,409,996, Oct. 22. Ethylene is polymerized at a temperature between 100 and 400° C. and a pressure between 400 and 3000 atmospheres in the presence of an alkyl hydroperoxide.

ADHESIVE. R. G. Drew (to Minnesota Mining and Manufacturing Co.). U. S. 2,410,053, Oct. 29. An adhesive composition comprised of rubber, a thermo-softening rubber-compatible resin adapted to produce tack and a minor proportion of an oil-soluble, heat-advancing, rubber-reactive, phenol-aldehyde resin.

POLYESTERS. J. B. Howard (to Bell Telephone Laboratories, Inc.). U. S. 2,410,073, Oct. 29. Polyesters of high molecular weight are prepared by esterifying a mixture consisting of dihydroxy alkanes and carboxy hydrocarbons at a temperature between 180 and 250° C. in a closed vessel provided with a reflux condenser maintained at about 110° C. so as to allow the escape of water vapor, maintaining the conditions such that an excess of dihydroxy alkane remains after all of the carboxyl groups have been esterified, continuously bubbling a dry, oxygen-free, inert gas through the mixture during the esterification subjecting the resulting product to a high vacuum while maintaining the reaction temperature and continuing the bubbling of the inert gas so as to remove excess dihydroxy alkane and cause still further molecular growth by ester interchange.

ADHESIVE TAPE. W. E. Lundquist and W. Kellgren (to Minnesota Mining and Manufacturing Co.). U. S. 2,410,089, Oct. 29. A pressure-sensitive adhesive tape having a unified paper backing member comprising a flexible porous paper impregnated and unified by a non-tacky, non-hygroscopic copolymer of a vinyl ester and a neutral ester of an ethylene-alpha, beta-dicarboxylic acid which has already been esterified with a saturated beta-alkoxyethanol.

ACRYLIC POLYMERS. L. W. Rainard (to National Dairy Products Corp.). U. S. 2,410,103, Oct. 29. An elastic composition, substantially free from plastic flow is prepared by dissolving a polymeric methyl ester of acrylic acid in benzene, passing bromine into the solution, separating the treated polymer, mixing with sodium sulfide, molding to the shape which is desired, and finally vulcanizing the composition with heat.

COATING. C. K. Sloan and G. D. Patterson (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,410,187, Oct. 29. A pigmented protective coating for metal, comprising calcium chromate and a vehicle therefor consisting of an alkyd resin and a phenol-formaldehyde resin.

LIGNIN RESINS. M. R. Dusenbury (to Hercules Powder Co.). U. S. 2,410,205, Oct. 29. A resinous composition is prepared by heating a ligneous wood, water and a higher fatty acid containing conjugated unsaturation or an ester thereof at a temperature between 240 and 330° C. under superatmospheric pressure until the cellular structure of the wood has finally disappeared.

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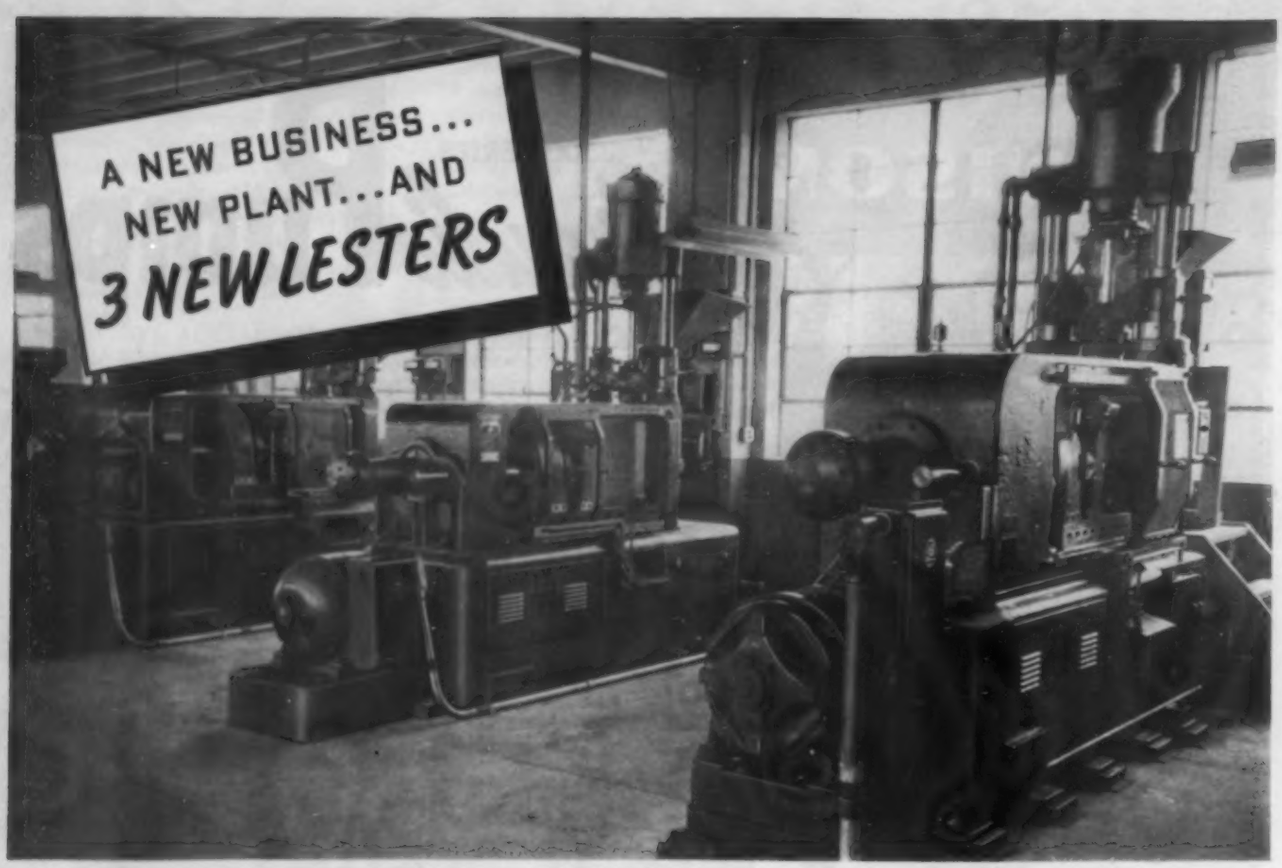

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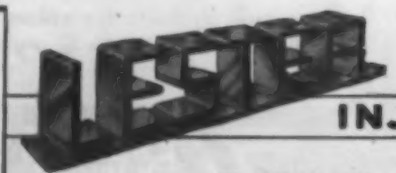

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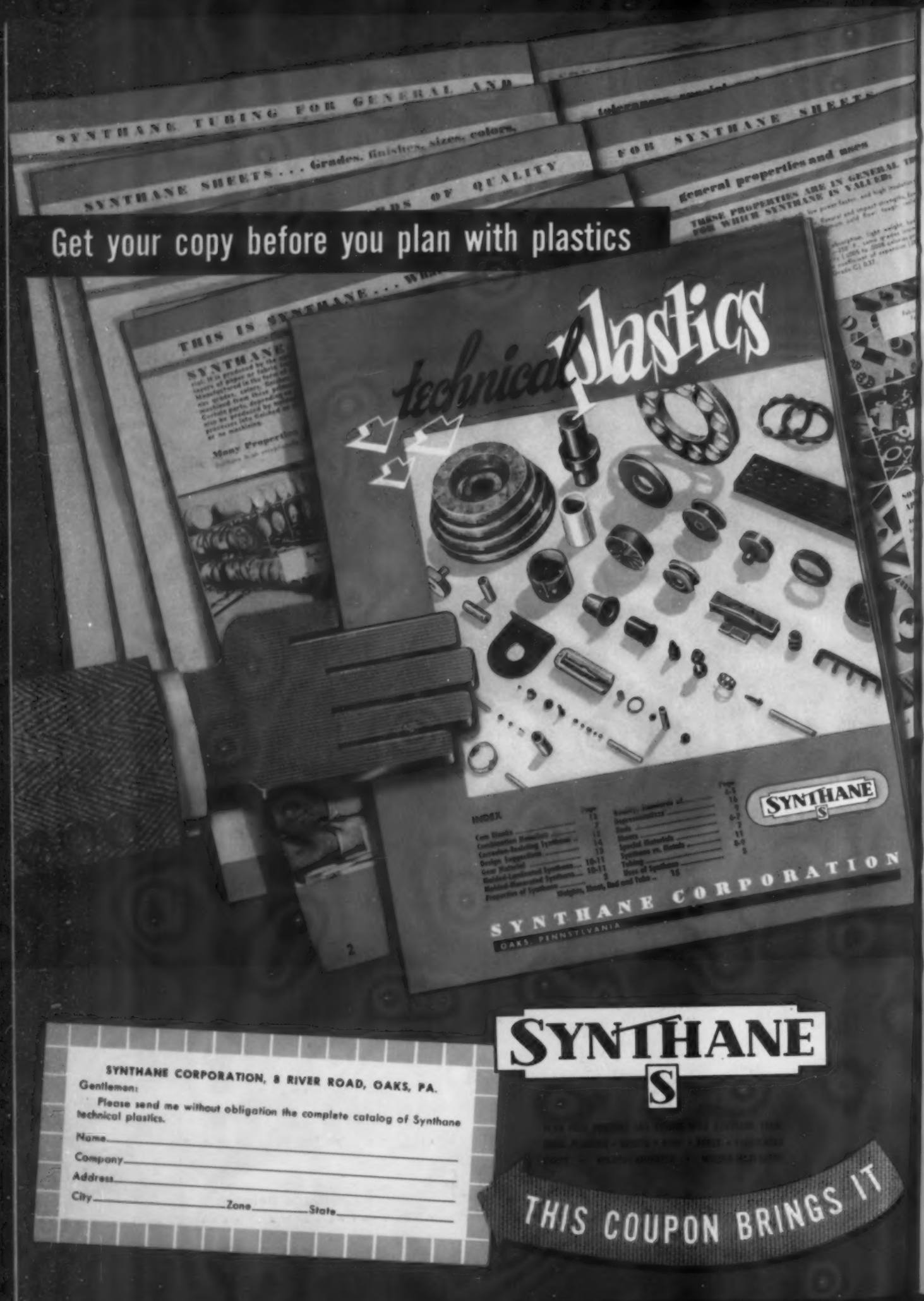
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No adhesives or solvents! THERMATRON seals plastic seams air-tight, water-tight and stronger — stronger than the thermoplastic material itself! With changeable dies machined to the outlines of your products, a single THERMATRON makes a one-shot operation of sealing beach toys, shoes, mitten-liners — hundreds of profitable specialties. For raincoats, shower curtains, etc., THERMATRON economically handles seams up to 72" long on a production basis.

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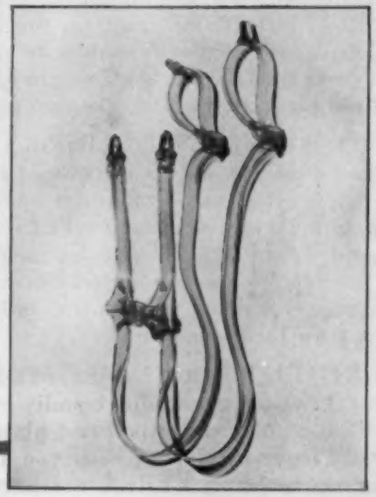

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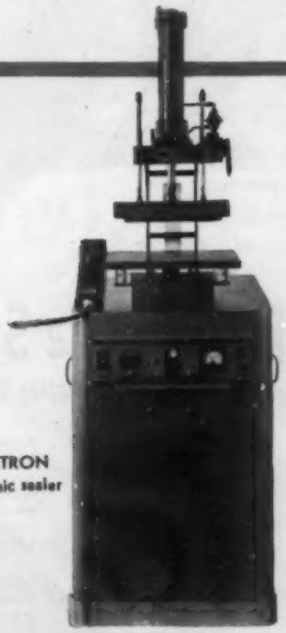
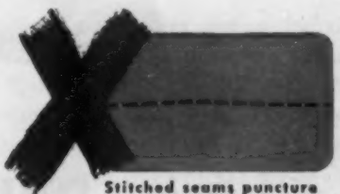


Type K-3-S THERMATRON "Heatmaster, Jr." electronic sealer



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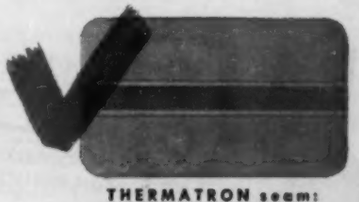

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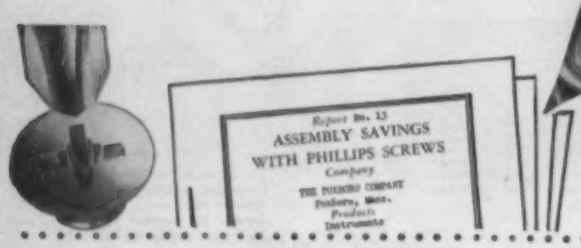

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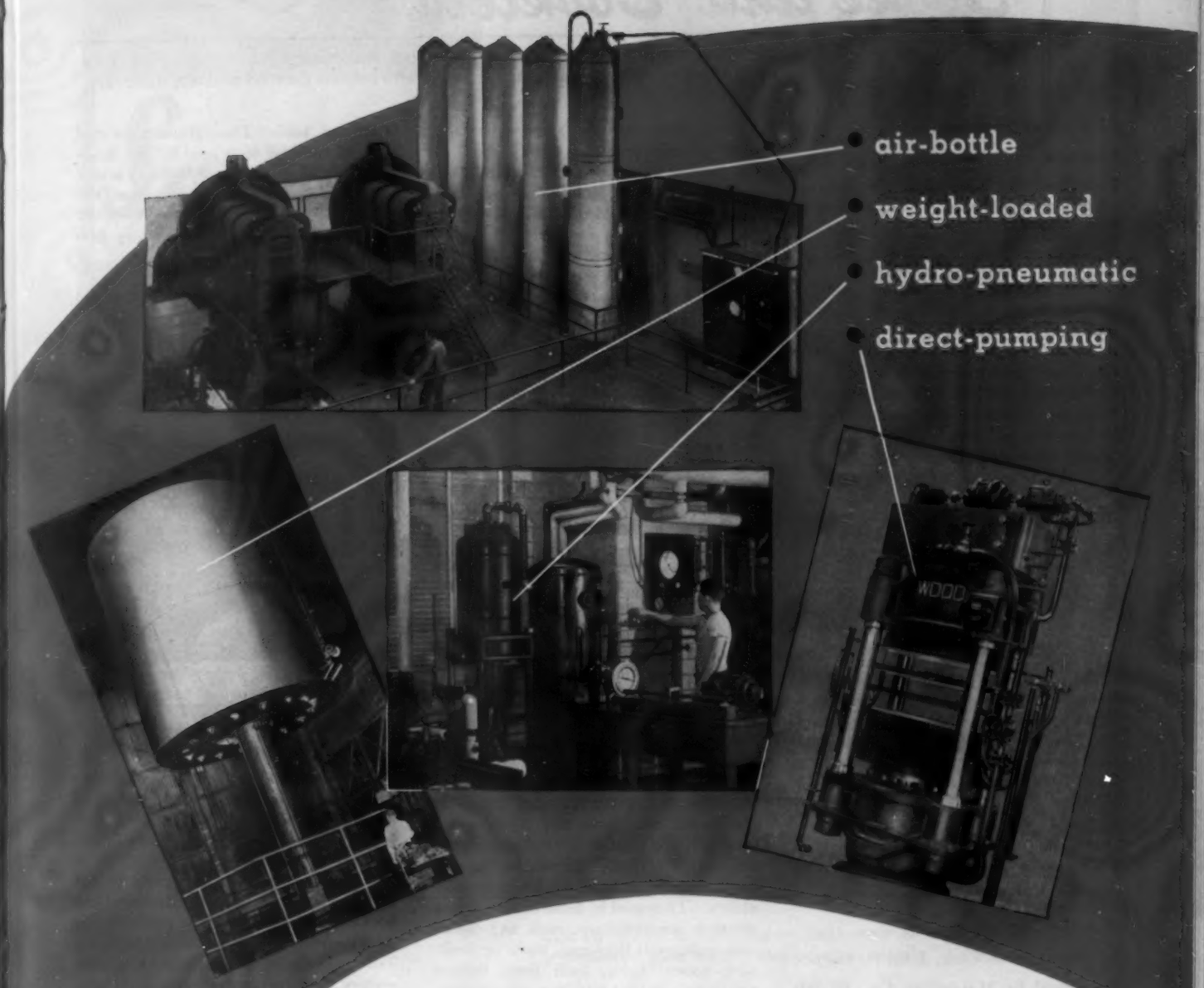

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Compiled by H. Bennett

Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y., 1946

Price $12.50 **826 pages**

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Precision Hole Location for Interchangeability in Toolmaking and Production

by J. Robert Moore

Published by Moore Special Tool Co., Bridgeport, Conn., 1946

Price $5.00 **448 pages**

This book is a comprehensive, well-illustrated review of all hole-location practices and their evolution to the point where the toolmaker can apply the principle of interchangeability to his own operations. The book also treats in detail the modern methods for finishing grinding holes in hardened parts. Included are 184 pages of Woodworth hole location tables for converting holes from 3 to 100 on circles to rectangular coordinates.

Plastic Craft

by Ernest S. DeWick, John H. Cooper

Published by Macmillan Co., 60 5th Ave., New York, N. Y., 1946

Price $5.00 **184 pages**

This book provides complete instructions for making useful and decorative articles from plastics. Each process used in working plastics is illustrated with step-by-step drawings. Sections are devoted to the various types of materials and the tools necessary in working them.

Applied Plastic Product Design

by Robert L. Davis and Ronald D. Beck

Published by Prentice-Hall, Inc., 70 5th Ave., New York, N. Y., 1946

Price $6.00 **285 pages**

This book has been written for designers so that they may take full advantage of special design considerations which will go far to improve the quality and reduce the cost of plastics products. The sections of outstanding importance are those relating to flow and shape, cut-off, parting lines and tolerances, molded holes and undercuts, design of extrusion parts and design of high and low pressure molded laminated parts.

Plastic Molds

by Gordon Thayer

Published by Huebner Publications, 2460 Fairmount Blvd., Cleveland, Ohio, 1946

Price $5.00

"Plastic Molds," in its third edition, deals with the design, manufacture and use of molds. Compression mold types are classified for study; transfer and jet molding are described; injection molds are presented both as units and broken down into their elements of design and construction. Mold sinking, applications of mold base standards and molding of screw threads are examples of detailed descriptions. A feature is the chapter devoted to enumeration of 149 Practical Points in Mold Design and Construction.

Design of molded articles—This booklet, Advance Chapter No. 6, of the S.P.I. Handbook, sets forth the fundamental principles of correct design and stresses the importance of design in relation to economical production and maximum serviceability. Discussed in detail in the various chapters are shrinkage, radii and fillets, undercuts, wall thickness, taper or draft, ribs, bosses, holes, flash lines, surface treatment, molded lettering and threads.

Conveyor—All-purpose conveyors for assembly, inspection and packing operations are discussed in a new bulletin just brought out by the Island Equipment Corp., 101 Park Ave., New York 17, N. Y. The booklet is illustrated with pictures of actual installations and drawings of parts of the equipment.

Maximum production plan—"Dynamic management control with Sched-U-Graph," a 32-page full-color booklet, describes an ingenious and practical chart-board application of the time-control principles for economy and efficiency. Copies of this brochure may be obtained without cost from Systems and Methods Research Dept., Remington Rand, Inc., 315 Fourth Ave., New York 10, N. Y.

Diamond tools—The various sizes and types of diamond tools used for the dressing of grinding wheels are listed in a new 4-page circular issued by Champion Diamond Co., Inc., 551 5th Ave., New York City. A copy is available to any firm interested in these tools.

Sealant—American Cyanamid Co., 30 Rockefeller Plaza, New York City, has recently issued a bulletin on the use of Laminac resin as a sealant for porous metal castings which must be pressure tight. Methods of impregnating castings with this polyester resin are described and illustrated by schematic drawings.

Reproduction process—Four-page booklet describing Kodak Transfax, a reproduction process for plastics, plywood or pressed woods and metals, has been issued by Eastman Kodak Co., and is available on request from Industrial Sales Div., 343 State St., Rochester 4, N. Y. The booklet explains the steps in using light-sensitive Transfax solution for transferring working diagrams, legends, designs, or other line work from a drawing to the fabricating material.

Protective coatings—The numerous products of Hercules Powder Co., Wilmington 99, Del., used in the manufacture of protective coatings have now been conveniently listed in a new four-page folder.

Injection molding—All aspects of the injection molding process are discussed in a booklet which has just been published by Tennessee Eastman Corp., Kingsport, Tenn. Designed for the molder and prospective manufacturer of parts made from the company's plastic materials, the 35-page brochure gives special attention to problems pertaining to the design and construction of molds. Also included is a handy index of molding terms and examples of problems encountered in molding.

Protective packaging—The Coatings Div. of R. M. Hollingshead Corp., Camden, N. J., has released a brochure on Cocoon, their new packaging plastic. Producing a package that is said to be tough, flexible and impervious to moisture, this material is based on modified film-forming resins which are carried in volatile solvents.

Pentaerythritol uses—Burrell and Neidig, Inc., 115 Broadway, New York 6, N. Y., have prepared for general distribution a complete bibliography of the uses of

Lustron

A MONSANTO PLASTIC

steps out in style

WHAT THE DESIGNERS WANTED:	WHY THEY CHOSE LUSTRON:
HIGH STYLE	The smart novelty of an all-plastic shoe was made possible and practical by Lustron's versatility and molding adaptability.
COLOR	Lustron's transparency and sparkling rainbow range of colors gave the designer fullest latitude for colorful eye-appeal.
LIGHT WEIGHT	Lustron—17% to 25% lighter than most other thermoplastics—answered shoe weight requirements ideally.
ECONOMY	Lustron's low pound cost, its light weight results in more units per pound, its adaptability to low cost molding processes, and the elimination of finishing processes, all add up to profit-making economy.

These important qualities and others, make Lustron, Monsanto's polystyrene molding compound, the most versatile of all plastics. Put them to work in your products. For complete information and technical assistance write, wire, phone: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Massachusetts.

See you in May at the Plastics Exposition in Chicago!

Trademark Reg. U.S. Pat. Off.

MONSANTO PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

pentaerythritol. This report consists of lengthy summaries of each reference and comprises over 400 pages referring to 354 patents and articles. It is felt that the material will be of real value to any person or company now using pentaerythritol or contemplating research with it. A price of $15 a copy has been established.

Thermal properties of Plexiglas—The determination of the heat losses through Plexiglas is facilitated by a bulletin released by Rohm & Haas Co., Washington Square, Philadelphia, Pa. Included in the brochure are data on the coefficients of thermal expansion and conductivity of Plexiglas 1-A, as well as an alignment chart for calculating heat transfer from air to air through Plexiglas panels.

Emulsions—Formulae as well as methods for preparing cosmetic and industrial emulsions of oils, waxes, fats and greases are treated in a 72-page loose-leaf booklet just reissued by Carbide and Carbon Chemicals Corp., 30 E. 42nd St., New York City. Extensive additions and revisions have been made to the material given in previous editions, including description of the uses of Tergitol wetting agents, Carbowax polyethylene glycol emollients and Cellosize hydroxyethyl cellulose thickener in the more recent emulsion formulae.

Remote indicating and control systems—Direct current remote indicating and control systems—what they are and what they are capable of accomplishing—are explained and illustrated in a new engineering bulletin released by Allis-Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1, Wis.

Hard chrome; uses and methods—An illustrated guide for fitting hard chrome, a process of electro-deposition, into peacetime production has been prepared by Nutmeg Chrome Corp., Hartford, Conn. Hard chrome in the plastics industry is thoroughly treated, with special emphasis on polishing, plating, matte finish and finishing tools.

Electrical equipment—A listing of approved electrical equipment, arranged alphabetically both as to subjects and as to manufacturers' names, has been published recently by the Canadian Standards Association.

Couplings—A booklet giving a clear description of coupling functions, plus recommendations of the correct types for specific applications has been prepared by Farrel-Birmingham Co., Inc., 475 N. Cliff St., Ansonia, Conn. Also included in this bulletin, No. 447, are complete engineering data with ratings, dimensions and weights of various types of couplings for use in the industrial and also in the marine service.

Control valves—"Pneumatic Control Valves and Controller Accessories" is the title of a new 36-page publication of the Foxboro Co., Foxboro, Mass. Among the subjects covered in this booklet are needle type valves, poppet and butterfly valves, the Vernier Valvactor for high-accuracy positioning of valve plungers, air switches and subpanels for remote valve control.

British industrial design—His Majesty's Stationery Office has published "Design, 46" for the Council of Industrial Design. This 144-page survey, discussing design in such phases of industrial application as office and household furnishings, interior decoration and fashion, is available for 6s. net from York House, Kingsway, London, W. C. 2.

Industrial safety charts—The U. S. Department of Labor has issued 24 safety charts depicting work hazards and dangerous work practices occurring in the operations of such machines as punch presses, metal shears and brakes and drill presses. Orders to the Government Printing Office should be addressed to the Superintendent of Documents, Washington 25, D. C., with remittance of 5 cents per copy.

A SINGLE AND EFFECTIVE FORM OF decoration is to be found in the Glo-Craft Edgelite plastic murals produced by Gull Industries, Inc., of Cleveland, Ohio. These murals, said to be the first to utilize flourescent black light in a complete-in-one-piece packaged unit, are about as simple to install as a picture is to hang.

The murals are made by applying a design, with fluorescent paint, to the back of a Lucite sheet. The sheet is then mounted in a frame which has a 360-BL fluorescent tube installed in a bottom channel. A standard ballast and starter are used with 110-v AC current to eliminate high operating expense and costly installation. Black enamel plywood is attached to the back of the frame to provide structural strength and prevent unwanted light reflections.

When lighted, the painted surfaces of the methyl methacrylate sheet glow brilliantly and the unpainted surfaces appear completely black. Colors may be chosen to obtain striking combinations and contrasts and to provide the desired lighting for lobbies, lounges and other rooms. Because the murals are very effective in surroundings considered too bright for "black light", they should prove decorative in night clubs, etc.

Announcing...

monoplex

a new name for Resinous Products' Monomeric Plasticizers

To make them easier for you to remember, The Resinous Products & Chemical Company announces the redesignation of their monomeric plasticizers. The following is a list of the complete line, new and old names:

MONOPLEX DBS	**(Dibutyl Sebacate)**
MONOPLEX DOS	**(Dioctyl Sebacate)**
MONOPLEX DOS Distilled	**(Distilled Dioctyl Sebacate)**
MONOPLEX DCP	**(Dicapryl Phthalate)**
MONOPLEX 5	**(Dibenzyl Sebacate)**
MONOPLEX 7 Distilled	**(Distilled Dibutoxy Ethyl Sebacate)**

Remember the new name, MONOPLEX, for your plasticizing needs. The products remain unchanged . . . to provide you with the same uniformity, quality and dependability.

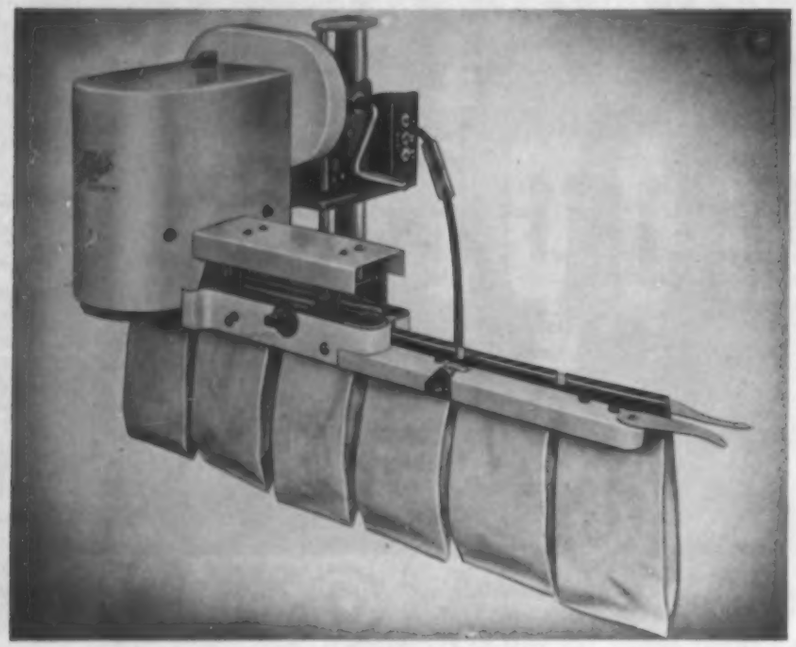
THE RUBBER CHEMICALS DEPARTMENT

Represented by Cia. Rohm y Haas, S. R. L., Carlos Pellegrini 331, Buenos Aires, Argentina, and agents in principal South American cities

THE RESINOUS PRODUCTS & CHEMICAL COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

New Machinery and Equipment



Conveyor-feed attachment for rotary heat sealer—Pack-Rite Machines, 714 W. Wisconsin Ave., Milwaukee 1, Wis., has announced a new conveyor-feed attachment for the 1947-A model Fast-Tite rotary heat sealer. A stream of any heat-sealing bags or pouches can be fed into the conveyor-feed attachment. Special alloy springs take hold of the bags and convey them through built-in preheater unit and sealing rolls. The travel of the bags is synchronized with the speed of the rollers —300 lineal inches per minute, without assistance from the operator. Positive grip is provided by the natural elasticity of spring tension, the spring-loaded guide bar and the natural heat of springs which pass around heated rollers and through preheater unit. No head-room is taken from the top of the bags, thus eliminating slack-fill. The attachment can be installed on sealers now in use by bolting to the frame and plugging in. Quick and easy replacement of springs can be made.

Milling and die sinking machine—Reed-Prentice Corp., Worcester, Mass., has introduced the 12V universal head milling and die sinking machine, a new concept in vertical milling machines for toolroom work, especially in the making of plastic and rubber molds, die casting dies, forge dies, jigs and fixtures. Its design, including universal head, centralized control panel, infinitely variable feeds and spindle speeds, makes it useful for die sinking, duplicating, boring, drilling and face or straddle milling.

The head is mounted on sliding ram and can be adjusted for all angles up to 45° front to back and 30° left to right. Electronic feed drive provides a feed range of approximately 1 to 100; namely, from $^1/_4$ to 24 in. per min. for table and saddle and from $^6/_{10}$ to 16 in. per min. for ram. A one step rapid traverse is also incorporated. The DC motor is rated 1 hp., 1750 r.p.m. The electronic unit is of the constant torque, half-wave rectification type and has current limiting, dynamic braking and no-voltage release circuits.

Wheel and tool dressing fixture—Allied Machinists of Waltham, 6 Water St., Waltham, Mass., has introduced the Gem-Flex, a wheel and tool dressing fixture. It forms any angle in addition to a number of inside and outside radii. It can be used to form tool bits, small dies and thread chasers, to back off reamers and cutters or as an indicator stand. When used as a surface gage, circles or chords of circles can be scribed in either vertical or horizontal planes. First and second standards are held in place with ball bearings. Tool bit slot sizes are as follows: $^3/_{16}$, $^1/_4$, $^5/_{16}$, $^3/_8$ and $^7/_{16}$ inches.

Dust collector—A dust collector incorporating a new principle in portable collectors has been announced by the Dust Filter Co., 1753 W. Lake St., Chicago 12, Ill. This unit causes the separation of a high percentage of the dust at the point of intake. A designed baffle plate that is placed beneath the filter tubes causes a rotation of the air and dust in a cyclone manner into the retaining pan at the bottom of the unit resulting in a deposit of the dust at that point before it has an opportunity to reach the filter tubes. Remaining fine dust is collected in the tubes. A static pressure of $6^1/_2$ in. is maintained constantly. It is equipped with a $1^1/_2$ hp., 3 phase, 220-440 volt motor and can handle two 4 in. branch pipes. It is recommended particularly for use on buffing, polishing and grinding machines.

Twelve speed band saw—Plastic, wood, aluminum, cold-rolled steel, angle iron, tool steel or cast iron can be sawed by the new Cerny vibrationless 12 speed band saw recently introduced by Ermac Co., 5531 S. Vermont Ave., Los Angeles 37, Calif. Speed range is from 85 to 1750 feet per minute. General specifications are: capacity of throat, $17^1/_2$ in.; table to guide, $10^1/_2$ in.; floor to table, 44 in.; overall height, 72 in.; width, 38 in.; breadth, 20 inches. The cast-iron alloy table tilts to 45° for angle sawing by half turn of the socket-head cap screw. Guides are adjustable. Four size guide pins are furnished for blades from $^1/_8$ to $^5/_8$ inch.

Router and round-end mortising bits—Designed by the Barron Tool Co., Detroit 1, Mich., for use on any standard type drill press or routing machine at spindle speeds of from 170 to 5000 r.p.m., these 45° helix angle double spiral flute bits are ground from tool steel drill rods. A simplified lip structure insures easy resharpening and leaves a smooth bottom surface. They can be used for veining, routing, grooving, inlay and mortising operations on plastics or wood. The bits come in sets of six and range from $^1/_8$ to $^1/_2$ inch.

Belt sander and tool grinder—An improved Model 40 belt sander and tool grinder for tool grinding, deburring and finishing of small parts in wood, metals, plastics, glass and rubber has been developed by Woods Engineering Co., Norwalk, Conn. The machine is easily adjusted for horizontal or vertical operation and has a platen work area of 5 by $8^1/_2$ in.

NEVER SAY it can't be done until you've looked into KYS-ITE

Case of the "can't-be-done" high-chair tray—(name of customer on request)

1 They wanted an improvement on wood . . . "finish wore off . . . unsanitary . . . considerable breakage." They looked at plastic . . . "in time it faded." And a composition . . . "as it aged, it became brittle." They were almost ready to give up the search . . .

2 Then they contacted KEYES. Skepticism changed to enthusiasm as KYS-ITE trays passed all tests. They write . . . "our faith in your firm was justified."

3 NOW, a year-and-a-half later, KYS-ITE's durability still amazes everyone. They write . . . "no changes were ever necessary and we have never had a tray returned, which speaks for itself. We have had many compliments from the trade and from our competitors."

Here's why **KYS-ITE** does "the impossible" so often:

GREAT STRENGTH WITH LIGHT WEIGHT . . . Preformed before curing; impact strength up to 5 times that of ordinary plastics.

UNUSUAL ADAPTABILITY . . . lends itself to large hollow pieces, complicated pieces with projections or depressions, large or small shapes with thin wall sections.

INTEGRAL COLOR AND FINISH . . . highly durable, unusually resistant to abrasion, impervious to mild alkali and acid solutions. A wipe and it's bright!

NON-CONDUCTOR . . . **KYS-ITE's** dielectric properties are important where safety is a factor. It is also a poor conductor of heat and cold. Non-resonant, non-reverberating.

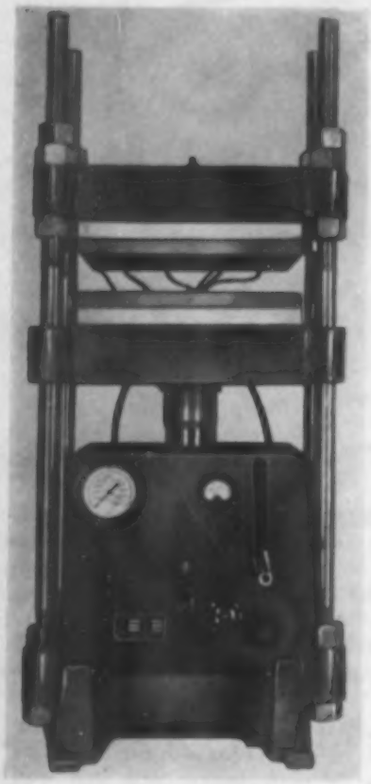
If you're troubled with a molding problem, put it up to KEYES. We're accepting new specialty business again, scheduling production as orders arrive. Inquiries are invited.

KEYES FIBRE COMPANY
420 Lexington Avenue
New York 17, New York
Plant at Waterville, Maine

KEYES
MOLDED PRODUCTS

standard abrasive belt is 4 by 36 inches. Pulleys are 4 by 4½ in. machined aluminum and tested to 5000 r.p.m. The machine has a thumb screw control for belt tracking and tension. The work dam is adjustable to any angle while the work platen is reversible and can be used on either face.

Hydraulic presses—Laboratory Specialties, Inc., 144 S. Wabash St., Wabash, Ind., has announced a line of hand-operated hydraulic presses. They can be used for lamination and fabrication, extraction of



oils and waxes, compression testing of heavy springs, testing to destruction of building materials, extrusion testing and broaching, small scale control and experimental work on plastic molding and for testing of molds before turning them over to production. The line includes 3-ton, 12-ton, 20-ton, 30-ton and 50-ton presses. Specifications for the 50-ton press shown here include: thermostatic control, ± 0.5° F. differential; temperature indicator, continuous 0 to 600° thermocouple type; wattage, 4200; maximum daylight opening, 10 in.; platens, 12 by 15 in.; floor area, 18 by 22 in. and weight, 1125 pounds. The stroke is 6½ inches. Steel platens may be obtained with electric heating elements and water cooling.

A controlled temperature quench tank—Tenney Engineering, Inc., 26 Avenue B, Newark 5, N. J., has announced a new development in controlled temperature quench tanks for use by the plastics industry for production of extruded plastics. This corrosion-resistant metal tank, set into a steel frame, is completely insulated. A refrigeration compressor and motor are below the tank on shock-proof mountings with compressor connected to copper bare tube refrigeration coils on the tank wall and floor for maintaining low temperatures. On the front panel is mounted a single-pen recording controller which has a temperature range of from plus 20 to 200° F.

Thickness gage—The Audigage, a portable self-contained instrument for measuring thickness of steel, aluminum, brass, copper, glass and other materials from one side only, has been announced by the Branson Instruments, Inc., Joe's Hill Rd., Danbury, Conn. This Model FMSS-4 utilizes a crystal-type gage head powered by a frequency-modulated electronic oscillator. It provides a means whereby audible signals are produced corresponding to harmonic resonance. The frequency difference between any two adjacent audible signals as read on the turning dial is readily converted into wall thickness on a concentric thickness scale. The gage covers a range of from ⅛ to 12 inches.

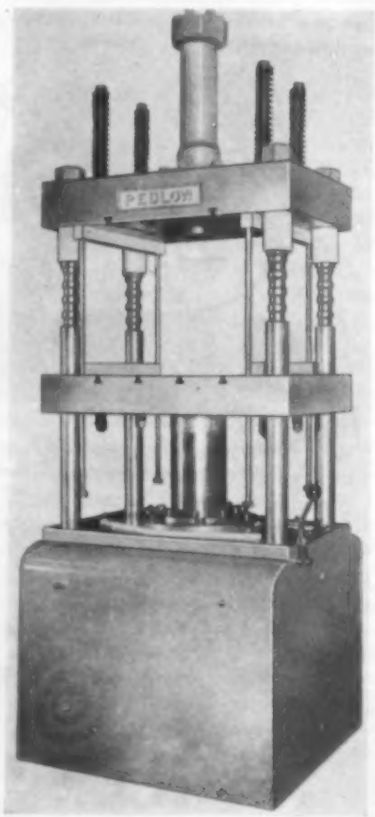
Temperature controller—Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa., has introduced a new, low-cost temperature controller, the Electromax, designed for those applications where indicating and recording are not required. The controller signals and controls only, although temperature readings can be taken manually at any time. It consists of a Wheatstone bridge circuit with a vacuum-tube amplifier as the detector. The length of leadwires does not affect calibration and the location of the resistance thermometer bulbs.

A hydraulic pump—A new simplex, double-acting hydraulic pump powered by air has been developed by the Aldrich Pump Co., Allentown, Pa. It is applicable to hydrostatic test service for various numerous hydraulic pressures and is also suitable for use with hydraulic presses in small molding press plants. According to the company, initial and operating costs are lower than for electric or motor driven units and troubles with "wire drawing" through relief valves are eliminated since the pump stalls when the desired hydraulic pressure that is developed corresponds to the air pressure used. This hydropneumatic power unit, as it is called, is operated by a vertical double-acting air cylinder and piston that is direct-connected to the upward-acting pump plunger and yoke-connected to the downward-acting plunger. The pump cylinders are opposed and are of integral construction.

By specifying proper ratio of air piston to hydraulic plunger, hydraulic pressures up to 20,000 lb. can be obtained with maximum air pressure of only 100 pounds. It is not intended, however, for use where continuous flow of liquid is required.

Surface roll temperature testing instrument—The Pyrometer Service Co., 230 River Rd., North Arlington, N. J., announces the addition of the RollTemp to its line. Essentially a surface pyrometer with the indicating instrument separated from the thermocouple, the instrument is used for obtaining accurate surface roll temperatures in the plastic, rubber and metal industries. The instrument proper is mounted permanently on the machine requiring tests and the operator is required to handle only the thermocouple.

Plunger molding press—Pedlow Machine Co., Chester, Pa., has introduced a standard 50-ton auxillary ram molding press for compression molding, transfer molding or auxiliary plunger transfer molding. The press is completely self-con-



tained and has an overhead ram for auxiliary plunger transfer molding. Designed with knockouts, it has an adjustable daylight opening. One small lever controls the motion of the main and of the overhead ram.

Hot dip tank—Two models of a hot dip tank for plastic skin protective coating dipping operations with air-turbine mechanical agitation and automatically acti-

riding high

Republic XF-12
Military forerunner
of Rainbow transport

and inside...

Flexmir's UNBREAKABLE PLASTIC MIRRORS!

Soon to join America's great commercial air fleet will be Republic Aviation Corporation's revolutionary transport, the Rainbow. Flexmir's mirrors will be used exclusively in powder rooms, berths, etc., because Republic's designers and engineers specified a plastic mirror that was light in weight, durable, resistant to temperature change, easy to maintain, decorative and beautiful.

Flexmir's Plexiglas and Lucite mirrors are available in sheets measuring 20″ x 50″ or less, in thicknesses of 1/16″ to 1/2″ in silver, or any brilliant color. Easily fabricated, Flexmir's mirrorized plastics are used extensively for gift novelties, lamps, display fixtures, switch plates, cosmetic items and a vast number of other products. When planning your next product, consider the varied applications of Flexmir's plastic mirrors. For additional information, write today!

★ ★ ★ *Other Flexmir services include brilliant metallic finishing in gold, silver and color . . . of plastic buttons, jewelry, novelties, bottle caps, etc. Colored metallized acetate sheets and rolls are available for sequins, packaging and decorative uses.*

PIONEERS IN METALLIZING PLASTICS

Flexmir INC.

20-28 BROOME STREET NEWARK 3, N. J.

AFFILIATED COMPANIES: PLASTICS FINISHING CO., INC., FLEXMIR DISPLAY CO., INC. METALLIC PLASTICS CO., INC.

vated water-cooling system have been announced by the Aeroil Products Co., West New York, N. J. Tanks No. 5 and 5E provide for rapid cooling of melt when necessary, enabling the user to change quickly the viscosity of skin coating. Indirect heating by means of an agitated hot oil bath that is thermostatically controlled at any temperature from 100 to 550° F. is another feature of both tanks. An adjustable weir at the end of the tanks keeps level of melt constant while enlarged pre-melt section and feeding hopper in a self-contained unit insures uninterrupted production.

Rotary cylinder beader—Hulbert Engineering Corp., Watertown, Wis., has announced a rotary cylinder beader which will handle cylinders from 2 to 10 in. in diameter of finished heights from 1 to 15 inches. Beading of all weights of material from 0.005 to 0.020 is feasible. Production rates vary from 20 to 30 pieces per min.—depending upon the diameter, height and weight of material in product. Machine (above, right) may be set up to bead one end, to bead both ends, or to bead one end and to turn a slightly outward flange on the other end to facilitate the

beading thereto of metal bottoms. The stations rotate continuously about the central column and beading pressure is applied by means of cams. At the same time, each individual head is oscillated in order to prevent sticking. The shell itself is gripped by light cast aluminum forms which are interchangeable. Loading is by hand or mechanical feeds while ejection of the finished work is by automatically controlled compressed air. The eight beading heads are electrically heated. As many as six different diameters of grooves may be cut in each beading plate.

Electrically-heated steam power boilers—Livingstone & Co., of 89 Broad St., Boston, Mass., has recently put on the market the Speedylectric steam boiler which can generate steam for pressures up to 200 p.s.i. and in volume up to 2 boiler hp. Solid rods are employed for electrodes and water between them is utilized as the resistance element. This permits producing about 65 lb. per hr. of steam at any desired pressure in small diameter vessels such as 8 or 10 in. steel tanks. The low-water danger is eliminated because, in the absence of water to make a contact between the electrodes, no current can pass, and, therefore, no steam can be generated. Pressure is controlled by a dial. According to the company, fire hazards are eliminated. In plastics molding, the presses can be located where convenient and operated day or night.

PAPER—TOO WEAK. PARCHMENT—too quick to tear. Fabrics—difficult to clean. Metal—incapable of transmitting light. Plastics—perhaps the ideal solution for lampshade material. Lamp shade makers have long sought a material with good light refractive properties,

toughness, quality appearance, resistance to heat and moisture, and which, in addition, was easy to clean and fabricate.

Synweb, a plastic material developed by H. W. E. Riley and Dr. Fred Gruenwald of Polyplastex United, Inc., New York City, with the cooperation of Owens-Corning Fiberglas Corp., seems to possess the desired qualities. It is a mat of spun glass fibers impregnated under heat and pressure with polyester resins and other special formulas to give it consistency, character, surface texture and flexibility necessary for lamp shade use. The firm has modified polyester resins and developed economic production methods so material can compete in better parchment price ranges.

A variety of Synweb sheets are being put on the market. Synglo No. 1, for example, is an opaque white, semi-flexible sheet with a limited bend radius. Synskyn No. 1, with a slight increased translucency, can be scored, pleated, sewed, printed, etc. Other sheets are given gold, silver, copper or smoky finishes. When a lamp with a Synweb lampshade is lighted, no glare or spot light from bulb is transmitted. Light is refracted and diffused smoothly across the shade.

Besides conventional shades, company foresees its use in tubular shades for fluorescent tubes in factories, offices and railroad cars.

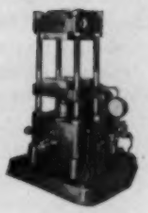
Fast, full power-operation
WITHOUT MOTORS OR PUMPS

50-ton Hydrolair, shown with lever control. 18" x 18" platen and hot plates. Overall dimensions: 40" x 27" x 65" high.

20-Ton, Bench-Type

20-Ton, Floor-Type

30-Ton, Floor-Type



30-Ton, Bench-Type

NEW BULLETIN
GIVES ALL THE FACTS

Bulletin 1036 tells the whole story—gives types, sizes, complete specifications. 20-ton presses have 8" x 8" platen; take 8" x 8" hot plates. 30-ton presses have 10" x 10" platen; take 10" x 10" hot plates. 20- and 30-ton floor-type models have handy shelf for tools.

THE NEWEST OF THE NEW
ELMES HYDROLAIRS

Patents Applied For

Hydrolairs are the *most economical* of all power-operated hydraulic presses to buy—and to use. They take their power *entirely* from the shop air line.

Each press is a complete, self-contained "package." Compact. Easy to install—and to *move* if ever necessary. Automatic, push-button, time-cycle control is optional on the 50-ton model, and a breathing cycle can be added, if desired.

No other hydraulic press can match new Hydrolairs for cost-saving, *speedy performance.* They turn out a *lot* of work. Phone, wire, or write for complete information. Distributors coast to coast.

ELMES
Since 1851
HYDRAULIC EQUIPMENT

LEVER CONTROL

Simple lever control on 20- and 30-ton models—and when furnished on 50-ton press—governs both quick-closing and instantaneous full pressure. Presses maintain selected pressure, and repeat at that pressure until reset.

ELMES ENGINEERING WORKS *of* AMERICAN STEEL FOUNDRIES, 225 N. Morgan St., Chicago 7, Ill.

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

Plastics Stock Molds*

SHEET ONE HUNDRED FORTY-SIX

Utilitarian items such as silverware trays, spice racks, children's dinner sets, tableware and card holders are suitable for kitchen use. The kiddies will be delighted to sup from these colorful dinner sets. The spice rack may be used in the bathroom to hold toilet articles.

1722. Silverware tray with four compartments; 12 in. long by 7 in. wide overall. Available in red, white, blue and green. Designed to fit in standard drawers of kitchen cabinet or cupboard.

1723. Children's cereal bowl with wide base to prevent tipping. Edge is bevelled and high walls discourage spilling. Overall diameter $6^1/_2$ in. Inside diameter 5 in. by $1^7/_8$ in. high. Available in pink and blue.

1724. Children's tumbler, bevelled to insure good gripping. Top diameter $2^1/_2$ in., tapering to 2 in. at bottom. $3^1/_8$ in. high. Available in pink and blue.

* Reg. U. S. Patent Office.

1725. Children's dinner plate with wide base to prevent tipping. High walls discourage spilling. Overall diameter $8^1/_4$ in. Inside diameter $6^1/_4$ in. by $1^1/_8$ in. deep. Available in pink and blue. Bevelled edge.

1726. Children's spoon, knife and fork with rounded edges for safety; $4^3/_4$ in. long. Available in pink and blue.

1727. Spice and utility rack with wall attachment; 12 in. long by $1^3/_8$ in. wide by 2 in. deep. Available in white, red, blue or ivory.

1728. Tableware set including teaspoon, tablespoon, iced teaspoon, table fork and cocktail fork. This set is available in ivory and in pink.

1729. Transparent teaspoon, 6 in. long.

1730—32. Card holders available in triangular, square and in round shapes. Triangular model is $4^3/_4$ in. long by 5 in. at base; the square holder is $4^1/_2$ in. square; round holder is $5^1/_4$ in. in diameter.

The names and addresses of the manufacturers who make these stock molds are listed on page 216.

Molders are invited to submit samples of stock products to appear on these pages as space permits.

TO ATTAIN excellence in plastic molding, many steps—each an essential part of the whole process—must be followed through accurately and thoroughly.
Every step of the way—designing, mold making, molding, and finishing—calls for the highest skill and experience, plus the proper plant facilities for efficient production. Combined, these operations can result in quality molding... plastics that "measure up" in performance, appearance and cost.
MACK experience and proven methods, plus three completely equipped plants, offer plastic molding that qualifies. Your inquiries are solicited; address Mack Molding Company, Inc., 100 Main Street, Wayne, N. J.
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News of the Industry

The Eastman Kodak Co., Rochester 4, N. Y., has announced that the name **Kodapak**, hitherto applied only to the thinner gages of the company's cellulose plastic sheet, will become the trade name used for all types and gages of cellulose acetate and other cellulose ester plastic materials distributed in sheet and roll form. Kodapak II, cellulose acetate butyrate, will continue to apply to all gages from 0.00090 through 0.002 inch.

C. K. Castaing Studio, 303 Third St., Huntington Beach, Calif., has moved to larger quarters at 109 Main St., Seal Beach, Calif.

The Plastics Div., Fabricon Products, Inc., 1721 Pleasant Ave., River Rouge 18, Mich., announces production of Phenopreg X-Crepe grades of phenolic resin impregnated paper. At the present time, two grades are being produced—Phenopreg X-400 X-Crepe, black, for low pressure molding and Phenopreg X-402 X-Crepe, black, for high pressure molding. Either grade of this paper is available in rolls, sheets, die cut forms or weighed coil charges.

Cincinnati Industries, Inc., Station Ave. & Big 4 R.R., Cincinnati, Ohio, developed and previously produced resin impregnated grades sold under the trade name Resin X-Crepe. It is now discontinuing impregnation and will devote its facilities to the production of basic X-Crepe and products derived from it. In conjunction with Fabricon, it is continuing its technical service activity.

Wadsworth & Woodman Co., Inc., 40 Worth Street, New York City, makers of coated fabrics, has become a division of the **Interchemical Corp.,** 350 Fifth Ave., New York City, and will be known as the **Wadsworth & Woodman Div.** Executives, operation and policies will continue unchanged. Interchemical's Research Laboratories will be available to the Division for the development of technological methods.

Rohm & Haas Co., Philadelphia, Pa., has acquired about 500 acres of land on the Houston Ship Channel, Deer Park, Texas, for erection of a chemical products plant. Construction is expected to get underway early this year.

Synvar Corp. of Wilmington, Del., has announced that its new casting resin, Synvaren 675, will be distributed by **Rhodes Industrial Corp.** of East Hampton, N. Y. Rhodes will also offer a custom casting service with this resin and in the near future offer standard shapes in various colors for general sale.

The Plastics Div. of Monsanto Chemical Co. at Springfield, Mass., has announced that construction of a new pilot plant to further plastics research is now under way. The new building, to cost an estimated $175,000, will be completed by early summer and will more than double present production, research and development facilities.

The Merrimac Div. at Boston, Mass., has also revealed that volume production of Skylac, a flame-resistant fabric finish for both exterior and interior surfaces of aircraft, has begun.

E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del., has announced that Trioxane, a polymer of formaldehyde useful as a fuel, solvent, plasticizer, intermediate in organic reaction processes and for a wide variety of other industrial purposes, is now available for commercial distribution.

The company has also announced establishment of two new sales offices on the West Coast, one at 243 E. Colorado St., Pasadena, and the other at 465 California St., San Francisco.

Wayne Engineering Research Institute of Wayne University, 448 Merrick, Detroit 2, Mich., is now offering a complete research service in plastics and related fields. In addition, equipment and personnel in all of the branches of basic and engineering science are available to furnish supplemental aid.

James L. Decker Products Co. is now completing a factory with 11,000 sq. ft. of space at 8509–15 Higuera St., Culver City, Calif. Machinery for injection and compression molding, and extrusion is being installed.

Gerber Plastic Co. has moved its general offices and production facilities from 2625–27 Locust St., St. Louis, Mo., to 308–10 S. Eighth St. It has acquired a two story building at this address and is now installing new injection and specially developed hydraulic equipment for forming large thermoplastic sheets.

Shell Chemical Corp's. $2,000,000 expansion program which is expected to increase the company's capacity to produce methyl ethyl ketone and secondary butyl alcohol by 150 percent is now well under way. The program is directed chiefly toward the installation of facilities for production of these chemicals at the Houston, Texas, plant. It is hoped that maximum production will be reached by the third quarter of 1947.

Carbide and Carbon Chemicals Corp., unit of **Union Carbide and Carbon Corp.,** 30 E. 42nd St., New York City, has announced that it will begin construction in the near future of units for the manufacture of Vinylite resins as an addition to its plant at Texas City, Texas. These new facilities will be located between LaMarque and Texas City, and will form a part of a general building program involving an expenditure of about $15,000,000. This project is an extension of a 1945 plant expansion program. In addition, the company expects to construct a unit for the production of ethyleneamines.

Watson-Standard Co., Pittsburgh 12, Pa., announces it is now manufacturing high solids Vinylite finishes. In clear and brilliant colors, they are prescription compounded and can be applied with any method of metal product finishing either before or after fabrication.

Modern Plastic Machinery Corp. is moving its plant from Long Island City to more extensive facilities at 15 Union St., Lodi, N. J.

Formica Insulation Co., Cincinnati, Ohio, is developing a glass-silicone laminate possessing valuable characteristics for electrical insulation applications in radar devices, technicolor television equipment and other research developments. The new plastic laminate is made from clean, staple-fiber glass fabric plus a silicone resin. Preliminary tests show that the laminate is extremely heat resistant, with silicone insulated motors already operating at temperatures in excess of 250° C. or 482° F. The company has also disclosed work on a cotton-base-melamine laminate adaptable to requirements of modern electronic design and glass-base laminate known as MF-77.

National Lead Co., 111 Broadway, New York City, has developed Plumb-O-Sil, a new stabilizer produced in two types for use with vinyl chloride or vinylidene chloride polymers. Adapted for use in producing a clear plastic, Plumb-O-Sil is co-precipitated lead orthosilicate and silica gel in the form of a soft, white

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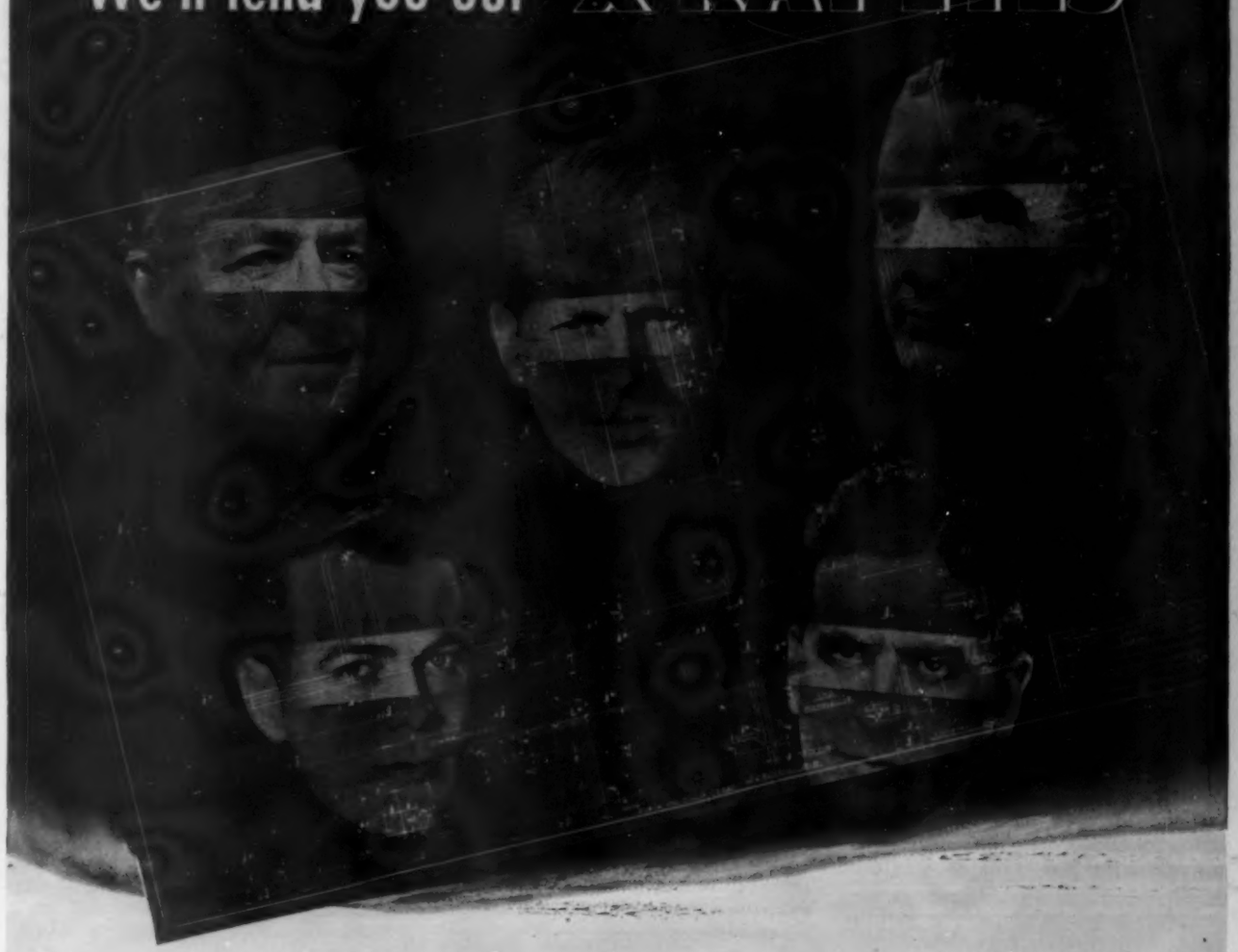

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The Plastic Materials Manufacturers Association, Inc., at its annual meeting in New York City on Jan. 9 elected the following officers: John R. Hoover, vice-president of B. F. Goodrich Chemical Co., president; Dr. D. S. Frederick, vice-president of Rohm & Haas Co., vice-president. F. H. Carman was re-elected general manager and John E. Walker, secretary-treasurer of the association, with headquarters in Washington.

A seven man board of directors which will include Mr. Hoover and Dr. Frederick was again named. M. G. Milliken, vice-president of Hercules Powder Co.; Felix N. Williams, vice-president of Monsanto Chemical Co. and Harry Krehbiel, president of Catalin Corp. of America, continue from the 1946 board. New board members are C. J. Romieux, sales manager, Plastics Div. of American Cyanamid Co. and W. Stuart Landes, vice-president of Celanese Corp. of America and the retiring president of the association.

JOHN R. HOOVER

DR. D. S. FREDERICK

Arnold E. Pitcher, general manager of Plastics Dept., E. I. du Pont de Nemours & Co., Inc., and James L. Rodgers, Jr., vice-president of Libbey-Owens Ford Glass Co., both past presidents of the association, will serve in an advisory capacity to the board of directors.

The Resin Adhesive Div. of P.M.M.A. met the afternoon of Jan. 10 and elected Whiting N. Shepard, Plaskon Div., Libbey-Owens Ford Glass Co., as its chairman for 1947. In addition to Mr. Shepard, the managing committee of the Division will include Louis Klein, vice president of Resinous Products & Chemical Co., and C. F. Hosford, Jr., president of Pennsylvania Coal Products Co.

powder. Plumb-O-Sil A is produced with a refractive index of 1.64 to 1.67, making it an ideal stabilizer for use in vinylidene chloride plastics while Plum-O-Sil B with a refractive index of 1.58 to 1.60 may be used with vinyl chloride-acetate plastics of about the same index.

The company has also announced the development of Tribase, a hydrous, tribasic lead sulfate which can be used in any application calling for a white, highly reactive basic lead salt. Said to be an excellent stabilizer for vinyl plastics, the new product has a total lead content equivalent to 90 percent PbO, while its available lead oxide content is 67.3.

In a reorganization of the sales staff of the **Catalin Corp. of America** announced Jan. 1 by President Harry Krehbiel, the following appointments were announced:

Jack Weiss will continue as sales manager of the Cast Resins Div. while Irving B. Polhemus will serve as sales manager of the Liquid Resins Div. and Rupert W. Lindsey will become sales manager of the Molding Powder Div.

Casein Company of America, Div. of the Borden Co., 350 Madison Ave., New York City, has developed a new phenol-type adhesive, Cascophen RS-228, especially formulated for bonding wood through use of radio-frequency equipment. The new adhesive is said not to arc when electrodes come in contact with the squeeze-out of glue or with the glue line itself. At the same time, it allows the use of maximum power for quicker curing.

Cruver Mfg. Co., 2460 Jackson Blvd., Chicago 12, Ill., observed its 50th anniversary in business Dec. 6 with a dinner at the Midwest Athletic Club. More than 600 people attended and saw a testmonial presented to Curtis L. Cruver, president since the company's founding in 1896, on behalf of the employees.

Swedlow Aeroplastics Corp., Glendale, Calif., has been dissolved as of Sept. 30, 1946. **Shellmar Products Corp.,** Mt. Vernon, Ohio, has assumed all liabilities and all assets including patents, processes, formulae, War Department specifications, receivables and equipment.

Fred S. Carver has incorporated his 25-year-old business under the name **Fred S. Carver, Inc.** The business address is still 345 Hudson St., New York City.

A presentation of a trust fund to **Everett Houts, Jr.,** of Celina, Ohio, was made Dec. 31 by members of the plastics industry in a memorium to his father, the late **Everett M. Houts,** who was allocations officer of the Chemical Bureau of WPB during the war. It is hoped that additional funds will be contributed by other members of the industry until a large enough fund is established to provide for a college education for the son. Those in charge of the fund are: **Robert Ruark, Harry Krehbiel, A. W. Hamner, Jr., William Cruse, Clinton Blount,** and **Ernestine Gilbert.** Contributions may be sent to Miss Gilbert at 95-01 150th St., Jamaica 4, N. Y.

Pastime Products Co., 633 W. Larned St., Detroit 26, Mich., has announced development of a plastic graining process which is being made available to fabricators of Lucite, Plexiglas and cellulose acetate on a custom basis. This PGL Process offers a depth of grain perception, when viewed through transparent plastic, which is said to be startling in realism. The process can be applied to sheets of standard 20 by 48 in. or slightly larger dimensions.

The Bakelite Co. (Canada) Limited, 163 Dufferin St., Toronto, Ontario, Canada, is the new name of the Bakelite Div. of Carbide and Carbon Chemicals Limited. Management and personnel of the company remain unchanged.

The Drackett Co., Cincinnati, Ohio, in its annual report on 1946, declared that delivery of impact molding compounds in the form of preforms has been well received by molders. The company is now delivering preforms in any size, shape and weight required. The new plant at Sharon should be producing by mid-year 1947.

The Snyder Chemical Co. of Bethel, Conn., has introduced Synco resins, a new group of phenolic compounds characterized by complete color range, good light

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stability, rapid cure, low viscosity and lack of evolution of volatile matter during curing. They are available in the form of molding powder, molding sheet, laminating and casting resins, coatings, adhesives.

Polymers, Inc., of Middlebury, Vt., has been established by Gil Shaw, formerly in charge of Vinylite sheeting sales for Bakelite Corp., and will specialize in thermoplastic bristles. The company also offers consulting service in processing plastics other than that of conventional molding or of extrusion.

Bjorksten Laboratories at 185 N. Wabash Ave., Chicago 1, Ill., has been incorporated under the name **Bjorksten Research Laboratories,** according to Dr. Johan Bjorksten, owner. The corporation will continue and expand the business of Bjorksten Laboratories. Officers are: Dr. Johan Bjorksten, president, treasurer; Stuart O. Fiedler, vice-president; A. Charles Lawrence, secretary.

Precision Metal Turning Corp. is the new name of **Precision Metal Turning Co.,** 534 W. Broadway, New York City.

The Heyden Chemical Corp. plant at Fords, N. J., has announced construction of a $450,000 Fine Chemicals Building. The new building will provide an additional 5000 sq. ft. of floor space to be used in the production of organic chemicals. Date of completion will depend upon the time required to obtain necessary equipment.

Reichhold Chemicals, Inc., 601 Woodward Heights Blvd., Ferndale Station, Detroit 20, Mich., is now constructing a resin manufacturing plant on three acres of ground recently acquired in the northeast section of Rio de Janeiro. The plant is designed to conserve domestic supplies of castor oil, linseed oil, oiticica oil and glycerin, and to give better service to Brazilian customers. **Reichhold Chimica Industrial (de Brasil)** will be headed by Dr. Mario de Oliveira Brandao and H. G. Levy, officers of James Magnus, Ltda., Reichhold Chemicals' present Brazilian agents.

Personnel Changes

Bart Batty, former manager of the Cooke Paint and Varnish Co. of Kansas City, Mo., is now devoting his full time to consulting work in the plastics industry, specializing in thermosetting resins and compositions. He will continue to make his headquarters in Kansas City, Mo.

D. W. Drummond and **Arthur T. Bennett** have been elected vice-presidents of the Mathieson Alkali Works, Inc., 60 E. 42nd St., New York City. Mr. Drummond's new title will be vice-president, general manager of sales and Mr. Bennett's vice-president, general manager of operations.

Hans A. Eggerss has been elected president of the Continental Can Co., Inc., 100 E. 42nd St., New York City. **Carle C. Conway,** who has been acting both as chairman of the board of directors and as president, will remain board chairman and chief executive officer of the company. Since February 1946, Mr. Eggerss has been executive vice-president.

F. T. Fletcher, late general manager of De La Rue Plastics, London, England, will be at the offices of Victor I. Seroussi & Co., 100 Gold St., New York City, this month. His visit to the United States is in connection with the plant and material requirements of the new Egyptian National Plastics Co. of Cairo.

George W. Wacker, who was in charge of the Plastic Press Div. of the Clearing Machine Corp., has re-opened his engineering office at 4762 Reading Rd., Cincinnati, Ohio, where he will specialize in the design of large, low cost injection presses for both thermosetting and thermoplastic materials.

H. E. Roche has been named manager of the Production Dept., Chemical Div., Koppers Co., Inc., Pittsburgh 19, Pa.

A. A. Sellers has been appointed manager of the Koppers chemical plant at Kobuta, Pa. **S. C. Whitehouse** will be assistant manager and **H. M. Hartong,** chief chemist.

Luke H. Sperry, member of the board of directors and director of engineering for Hercules Powder Co., Wilmington, Del., retired on Dec. 31. **Ernest S. Wilson,** chief engineer, becomes director of the Engineering Dept. and **Ray N. Wheelock,** assistant director.

Hans Peter Nelson, industrial designer, has opened a studio at 1510 Belle Plaine, Park Ridge, Ill.

John Albert announces the opening of his studio devoted to industrial design at 731 Maryland Ave., York, Pa.

Arthur A. Regel, former engineer in the Plastic-Insulation Dept. of United States Rubber Co., has joined Harte & Co., Inc., 267 Fifth Ave., New York City, as chief chemist in charge of laboratorial research in division of plastic fabrics and sheetings.

John J. Healy, Jr., director of development for the Merrimac Div., Monsanto Chemical Co., at Everett, Mass., has been appointed assistant general manager of the division.

Eight other appointments have been announced. **Carl F. Graesser** has been named sales manager of thermosetting molding materials for the Plastics Div. He will be succeeded as assistant sales manager of thermosetting molding materials by **C. L. Richards, Jr. T. J. Martin** takes over as manager of the St. Louis branch office. **W. H. Face** becomes assistant to the sales manager of thermoplastic molding materials.

Robert B. Semple, of St. Louis, has been named director of the General Development Dept. He will be succeeded as petroleum chemicals sales manager by **John Wade Newcombe** of the Petroleum Sales Dept.

Organic Chemicals Div. promotions are: **William G. Krummrich,** assistant division general manager; **David L. Eynon, Jr.,** assistant to the division manager and acting plant manager of the company's Nitro, W. Va., unit.

Robert H. Evans has been elected assistant treasurer and assistant secretary of the Riegel Paper Corp., 342 Madison Ave., New York City.

Don Rogers, vice-president and general manager of the Mac-o-lac Paint & Varnish Works, Detroit, Mich., has severed his connection as company officer to devote more time to the Rogers Chemical Corp. of which he is president. Rogers Chemical Corp. was organized in 1945 to produce household and industrial chemicals and to do research on plastics and coatings. It is now starting production on aircraft, household, industrial and marine finishes.

Lauren B. Hitchcock has been appointed vice-president in charge of the Chemicals Dept. of the Quaker Oats Co., 141 W. Jackson, Chicago, Ill. Other appointments are: **Fredus N. Peters, Jr.,** vice-president in charge of chemical research and **Frank F. McKinney,** sales manager of the Chemicals Dept.

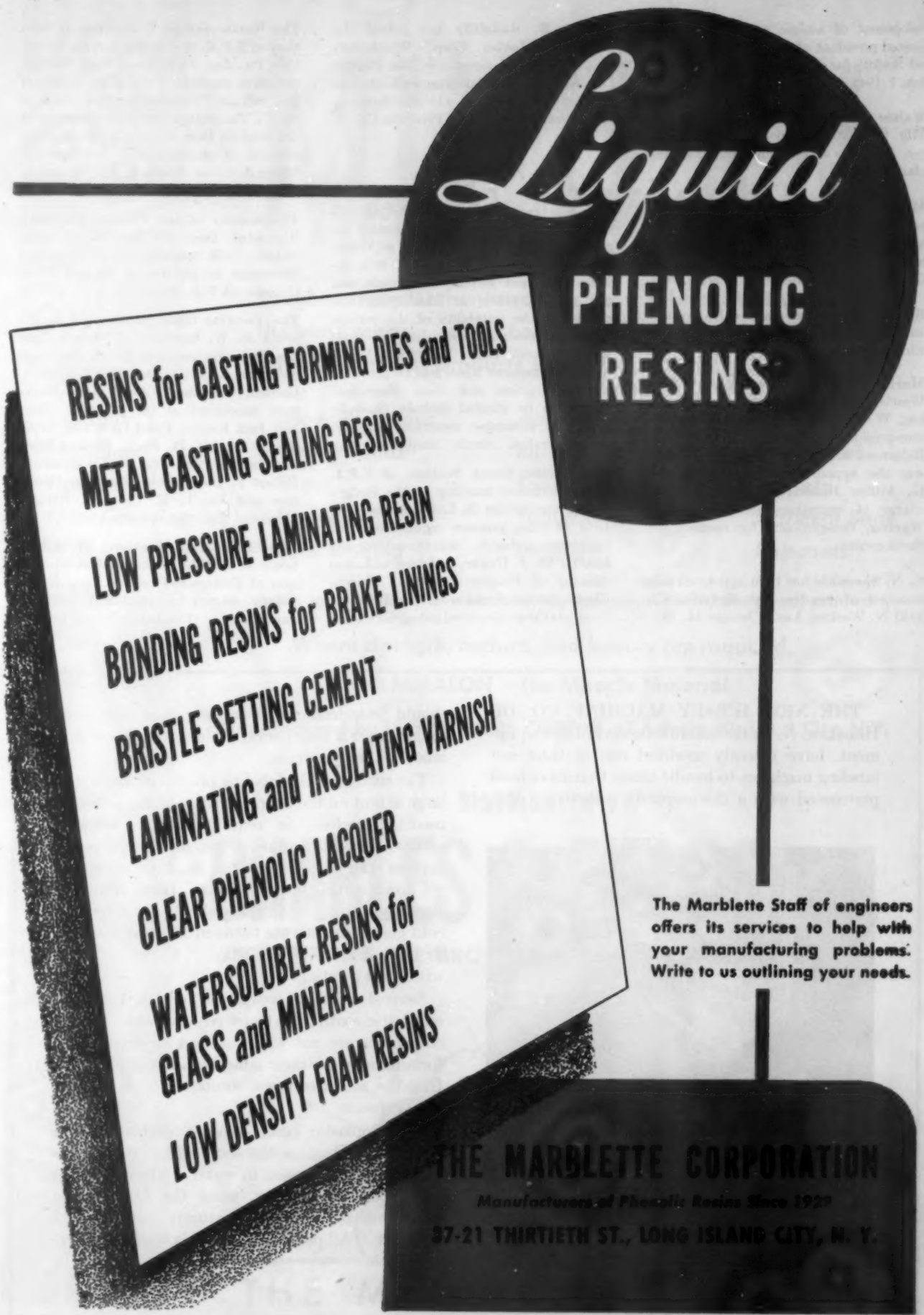
R. M. Ellis has been elected vice-president of Hungerford Plastics Corp., Murray Hill, N. J.

Kenneth C. Andrew has been appointed Ohio representative for F. G. Findley Co., 3033 W. Pemberton Ave., Milwaukee 10, Wis., makers of industrial adhesives.

Charles William Pennington has been appointed sales manager of clothing and coated fabrics for United States Rubber Co., with headquarters in the Mishawaka, Ind., plant. Promotions of **Herbert S. McWhorter** to sales manager of the Pacific Coast Div. and of **Louis J. Healey** to district manager of the San Francisco branch were also announced.

Dr. Eugene Mittelmann has resigned his position as director of electronic research and development of the Illinois Tool Works, to organize his own research and development organization. It will be devoted to the applications of electronics in industry and will be located in Chicago at 427 W. Wrightwood St.

Dr. Charles Allen Thomas, vice-president and technical director of Monsanto Chemical Co., and key figure in the de-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velopment of atomic energy, has been elected president of the American Chemical Society for a one-year term beginning Jan. 1, 1948.

Walter R. Speck has joined Steiner Mfg. Co., 100 Metropolitan Ave., Brooklyn, N. Y., as factory superintendent and plant engineer.

Maurice Spain, Jr., and **E. Kirby Preston** have been appointed sales representatives in the Cleveland and New England areas, respectively, for Chemaco Corp., 10 Snyder, Berkeley Heights, N. J.

Ray H. Morris has resigned his position with Hardinge Brothers, Inc., located in Elmira, N. Y.

Marlin G. Geiger, vice-president of the Westvaco Chlorine Products Co., Charleston, W. Va., has been named executive vice-president of Davison Chemical Corp., Baltimore 3, Md. **Elmer B. Dunkak** was also appointed vice-president; **Dr. G. Miller Hebbard,** vice-president in charge of operations and **Charles E. Waring,** vice-president for research and development.

C. N. Sprankle has been appointed sales manager of Sandee Manufacturing Co. 3945 N. Western Ave., Chicago 18, Ill.

Milton R. Radcliffe has joined the O'Sullivan Rubber Corp., Winchester, Va., as technical director of the Plastics Div. where he will supervise work on plastic film and sheeting. He was formerly with Firestone Industrial Products Co.

Meetings

The St. Louis Chapter of S.P.E. will sponsor a 15-week course in plastics beginning the middle of February at Washington University in St. Louis. It is designed to assist buyers, salespeople and the general public in identifying and evaluating the suitability of the various types of plastics materials and end products for specific uses. Exhibits of industrial and consumer items will be provided for examination and class discussion. Topics to be studied include phenolic urea and melamine materials, polystyrenes, acrylics, vinyls, textile coating.

The Pacific Coast Section of S.P.I. held a technical meeting at the Rodger Young auditorium in Los Angeles, Dec. 10. "Molding pressure requirements for the plastics industry," was the subject of a talk by W. J. Dewar, assistant technical director of Plastics Institute. Warren Clarke, project engineer of Adel Precision Products Corp., discussed industrial valves.

The Northwestern Pennsylvania Section of S.P.E. met at the Kenyon Hotel, Erie, Pa., Jan. 9 and heard J. H. DuBois, executive engineer of the Shaw Insulator Co., talk on "Transfer molding comes of age." The section also held a meeting at the hotel on Dec. 10. Phillip R. Marvin, director of research and development, Milwaukee Gas Specialty Co., spoke on "Physical properties of plastics."

The Society of the Plastics Industry (Canada), Inc., 159 Bay St., Toronto, Ontario, will sponsor the fifth annual conference on plastics at Niagara Falls, Ontario, on Feb. 19 and 20.

The Central Ohio Section of S.P.E. heard M. W. Burkhart of Newark Plastics, Inc., discuss mold design and engineering at a meeting Dec. 20 at Hoffman's, Garden, Columbus, Ohio. New officers were announced at the meeting. They are: Jack Knight, Fabri-Form Co., president; Donald D. Beck, Plastics Div., Continental Can Co., vice-president; Robert L. Davis, Fabri-Form Co., treasurer and Dr. L. E. Cheyney, Battelle Memorial Institute, secretary.

The Cleveland Section of S.P.E. heard E. F. Gibian, chief industrial engineer of Thompson Products, Inc., discuss process control by statistical methods, Jan. 10. (*Please turn to next page*)

THE NEW JERSEY MACHINE CO. OF Hoboken, N. J., the manufacturers of label equipment, have recently modified one of their wet labeling machines to handle labels that have been pre-coated with a thermoplastic adhesive. This should be welcome news to companies that have sought, over a long period of time, a means of dry labeling their products.

The success of the labeling process depends to a large extent on the characteristics of the adhesive used. Therefore, in requisitioning a suitable adhesive from the adhesive manufacturers, paper makers and converters, the machine company set down certain specifications. These specifications were that the adhesive should: 1) adhere to cold glass; 2) activate between 150 and 250° F.; 3) have a good "time delay"; 4) not interfere with good printing.

Several adhesive companies furnished a thermoplastic coating that met requirements. These companies are not willing as yet to divulge the formulations for their adhesives, but it is known that the mixtures are a combination of thermoplastic resins.

Thermoplastic labels have a permanence of adhesion. They withstand refrigeration, humidity and immersion in water. They may not be lacquered, however, since the high drying temperatures would prematurely activate the adhesive. All printing of labels is done on the reverse side.

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MIRALON

THE MIRACLE MATERIAL

The Detroit Rubber and Plastics Group, Inc., and the **Detroit Section of S.P.E.** held a joint dinner meeting at the Detroit-Leland Hotel, Dec. 13, and heard Dr. H. N. Stevens, research coordinator of the B. F. Goodrich Co., speak on the Bikini atomic bomb tests.

New officers of the Rubber and Plastics Group are: J. P. Wilson, Ford Motor Co., chairman; C. W. Selheimer, United States Rubber Co., vice chairman and E. J. Kvet, Baldwin Rubber Co., secretary and treasurer.

The Hartford-Springfield Chapter of S.P.I. met at Hotel Bond, Hartford, Conn., Jan. 22. Speakers were: J. C. Green, Dept. of Commerce, who spoke on "Scientific reparations" and N. J. Rakas of Fisher Plastics Corp., who discussed present uses of plastics in the automobile industry.

The Quebec Rubber and Plastics Group met at the Ritz-Carlton Hotel in Montreal on Dec. 12. Lt. Col. A. R. Swinton, manager of the Electronics Apparatus Div. of the R.C.A. Co. of Canada, spoke to members on "Electronics in industry and the home" at this meeting.

James R. Turnbull, Monsanto Chemical Co., spoke on "Plastics in the home," at the twelfth retailers' plastics session Jan. 6 sponsored by the S.P.I. and New York University at the University's retailing school.

On Dec. 16, **Christopher W. Browne,** editor of *Modern Packaging* magazine, spoke on "Beauty and texture; color and form; visibility; effective lightness; and protective value of plastics in packaging."

Peter Muller-Munk, Pittsburgh industrial designer, discussed good product design in plastics at the tenth session on Dec. 9 while **W. Burdette Wilkins,** technical consultant and designer, and **L. J. Francisco,** of Formica Insulation Co., spoke on Dec. 2. Mr. Wilkins discussed low pressure molding and Mr. Francisco, laminated plastics.

The New York Section of S.P.E. met at the Sheraton Hotel on Dec. 17 and heard Harold Van Doren of Van Doren, Noland and Schladermundp talk on "Do industrial designers know plastics?"

The Plastics Engineers Association held its second annual Christmas party at Cavanagh's in New York City on Dec. 16. William T. Cruse, executive vice-president of S.P.I., discussed "How are plastics faring in the market place"?

The Newark Section of S.P.E. held its first meeting of the new year, Jan. 8, at the Newark Athletic Club. Walter R. Ellis, Compressed Air Products, spoke on "Basic hydraulics connected with plastic operations," and Edward Borro, Plastics and Chemical, Inc., discussed standardization of test methods.

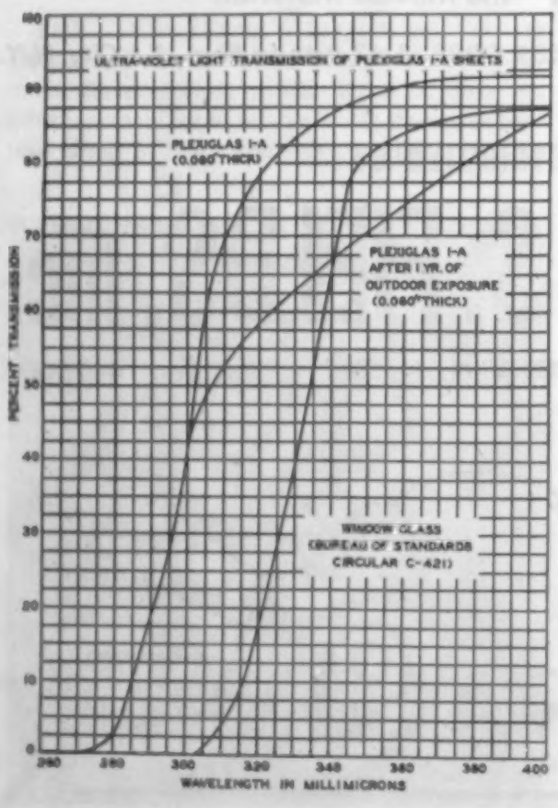
On Dec. 11, Henry Harding spoke on "Ethyl cellulose material developments," while J. Harry DuBois discussed selling high frequency preheating equipment.

The Philadelphia Section of S.P.E. met at Franklin Institute in Philadelphia on Jan. 20 and heard A. Valente, industrial electronics representative of Westinghouse Electric Corp., speak on radio frequency heating.

At a joint meeting with **S.P.I.** Dec. 9 at the Franklin Institute in Philadelphia, Rene Bouvet of Viscose Corp. discussed rayons, synthetic yarns, natural and other materials which are used in the making of cloth.

Sorry!

In the story, "Plastics make good reuse packages," appearing on pages 94 and 95 of the December issue, we failed to mention that Dorothy Gray's Magic Hour perfume package of acrylic was designed and fabricated by Vargish & Co., 220 Fourth Ave., New York City.



FOR THE OCCASIONS WHEN SUNSHINE must be filtered because there is too much of it, Plexiglas has developed a new acrylic sheet which is able to filter out excessive and harmful ultra-violet rays.

Known as Plexiglas Special U.V.A., the material can be used effectively in such applications as aircraft enclosures, boat canopies and sight-seeing bus tops where too much sunburn can be acquired. Or the material can be used in sun glasses and welding goggles to eliminate eye strain that is caused by glare.

This acrylic sheet has the same optical properties as its parent material—light transmission in the visible range and transparency being unaffected. It also keeps the same non-shattering characteristics of the familiar Plexiglas and can be fabricated by the same methods—with wood and metal tools or by forming in jigs with the aid of heat.

An unusual feature of Special U.V.A. is that its ultra-violet absorbing characteristics actually improve with age. The material is obtainable in sheets measuring from 6 by 12 to 67 by 79 in. and in thicknesses which range all the way from 0.060 to 2.000 inches.

Important Announcement

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Wood treatment

(*Continued from page 160*) alone. It was planned to have these chemical contents equal to the foregoing resin contents. The urea-treated material, however, contained 31 percent chemical and the phenol-treated material contained only 13 percent chemical. The low phenol content is due to loss of phenol on drying.

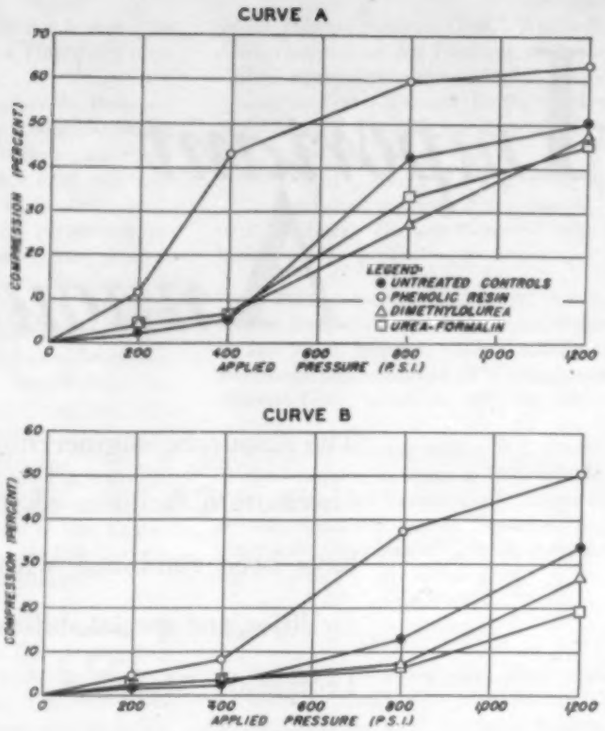
The following general conclusions may be drawn from a study of these curves:

1. The phenolic resin exhibited considerably better plasticizing action than either the urea-formalin or the dimethylolurea resin under all conditions studied. In order to compress the panels to one-half their original thickness, the urea resin treated material required about twice the pressure that was necessary for the phenolic resin treated material.

2. At 6 percent volatile content, both the dimethylolurea and the urea-formalin treatments improve the compressibility of the wood as compared with the untreated controls. Under the conditions used to reduce volatile content to 2.5 percent, dimethylolurea and urea-formalin mixes were cured to the extent that the panels were less compressible than the untreated control panels, even though the latter had moisture contents of only 0.5 percent.

3. Urea alone gave higher compression per unit of applied pressure than any of the resin mixes. The chemical content was, however, higher than that of any of the other systems and more than double that of the phenol.

4. Since the loss of phenol during the drying period was such that the final phenol content was only 13 percent, the compressibility values obtained for wood treated with it were less than those for urea alone or for the phenol-formaldehyde resin. These values were, however, considerably better than those obtained for the urea resins.



2—Comparison of the compressibility at various pressures of wood treated with phenol-formaldehyde resins, dimethylolurea and urea-formalin resins and having the lower volatile contents given in Table I. Curves A: Pressed at 310° F. Curves B: Pressed at 212° F.

Swelling and recovery tests

For swelling and recovery tests, one group of eight panels of 20 plies each was treated with dimethylolurea and another with urea-formalin, both at 25 percent

FOR THE LAZY LISTENER, SCOTT Radio Laboratories, Inc., has developed a remote control unit to use with their radio. This saver of time and steps makes possible the selection of radio stations at the touch of a button from any room in the house as it is connected to the radio by wires.

The base, or main body, of this unit is compression molded of general purpose phenolic in a walnut grain effect by Richardson Co., Melrose Park, Ill. A single cavity mold is used. The name "Scott" and the identifying numbers and other markings for the buttons are molded-in, and the 16 holes in which the plastic push buttons are set, are cored.

The push buttons, in amber colored acrylic or acetate, are injection molded by Gits Molding Corp. of Chicago, Ill.

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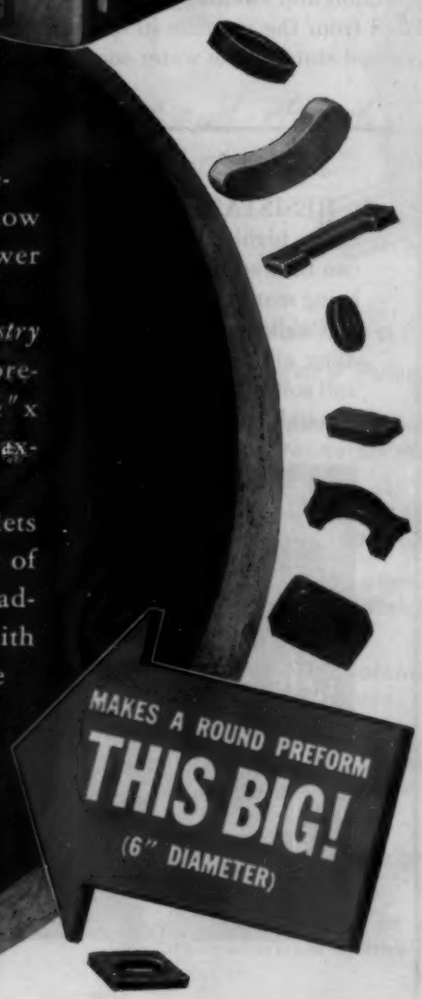

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solids contents and buffered at a pH of 8. A third group of 4 panels was treated with phenolic resin, also at 25 percent solids content. The treated material, after a diffusion period of 48 hr., was kiln dried 15 hr. at 140° F., glued with a phenolic-resin glue and then redried 1 hr. at 140° F. to remove glue solvent.

Four panels each from the dimethylolurea and urea-formalin treated groups were pressed in a parallel laminated manner at 1500 p.s.i. and 300° F. for periods of 10, 20, 40 and 60 min., followed by cooling in the press. The remaining 4 panels from each of these groups were pressed at 2000 p.s.i. under the same conditions of temperature and time. Two of the panels treated with phenol-formaldehyde were pressed at 750 p.s.i., one for 10 and the other for 40 min. at 300° F. and the remaining two at 1500 p.s.i., one for 10 and the other for 40 min. at 300° F., followed by cooling in the press.

The panels were trimmed to 5 by 7 in. and their specific gravity determined. Four swelling and recovery specimens were then cut from each panel (1/8 in. in the fiber direction by 2 in. wide), sanded to remove loose fibers and measured in the direction of compression (original panel thickness). After soaking in water for 10 days, the samples were again measured in the same direction and swelling plus recovery percentages calculated from the increase in dimension from the original pressed state to the water-soaked state, divided by the

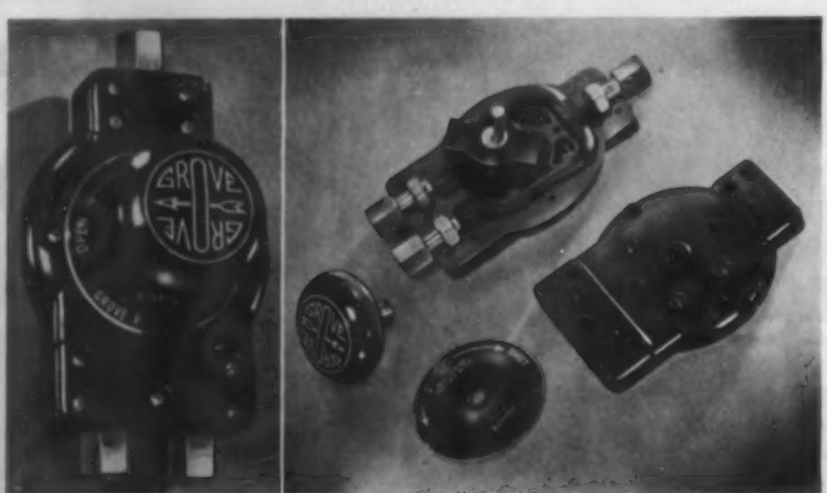
Table II.—Specific Gravity and Dimensional Stability Properties of Parallel-Laminated Cottonwood Compreg Made with Urea and Phenolic Resins

Treatment	*Pressure*	*Time in press at 300° F.*	*Specific gravity*	*Swelling and recovery*	*Recovery from compression*
	p.s.i.	*min.*		*percent*	*percent*
Dimethylolurea, 21.9 percent	1500	10	1.04	[a]	..
	1500	20	1.21	34.3	13.9
	1500	40	1.17	36.6	16.2
	1500	60	1.16	36.5	15.8
	2000	10	1.22	41.7	19.6
	2000	20	1.22	38.2	16.6
	2000	40	1.23	35.6	14.2
	2000	60	1.25	35.0	13.6
Urea-formalin, 28.0 percent	1500	10	1.22	30.8	11.2
	1500	20	1.22	27.7	9.2
	1500	40	1.26	21.9	5.2
	1500	100	1.21	29.9	9.1
	2000	10	1.27	32.6	13.0
	2000	20	1.28	27.9	8.8
	2000	40	1.30	26.0	8.5
	2000	60	1.31	22.7	6.1
Phenolic resin, 29.6 percent	750	10	1.29	11.1	0.6
	750	40	1.29	7.7	0.0
	1500	10	1.37	11.4	0.6
	1500	40	1.35	8.0	0.2

[a] Insufficient treating resin exuded from plies to bond them; specimens therefore delaminated. All other specimens, which were more highly compressed, bonded satisfactorily without the use of additional bonding glue.

RESISTANCE OF PHENOLIC MATERIAL to highly corrosive or erosive liquids and gases can be credited with its use in a three-way valve being manufactured by the Grove Refrigerator Co. of Oakland, Calif. This valve is capable of handling all types of fluids—gases as well as viscous and solid—carrying liquids. These are conducted through the unit in flexible molded synthetic rubber tubes which do not restrict the flow at all.

There are no metal parts to this valve. Two-piece body, the over-center cam and the handle are all molded of Durez by the American Molding Co., San Francisco, Calif. The synthetic rubber tubes that carry the fluid are set into grooves molded into the body. In fact, all flanges and holes, as well as all grooves, are molded in and no machining operations are necessary.



The Grove valve, available in 1/8 and 1/4 in. sizes, can be used for hydraulic or pneumatic cylinder operations. Its over-center cam opens and closes tubes at each half turn of a handwheel but the valve also has a self-locking feature which makes possible extended shutoffs. Maximum working pressure is 250 lb., maximum temperature is 150° F.

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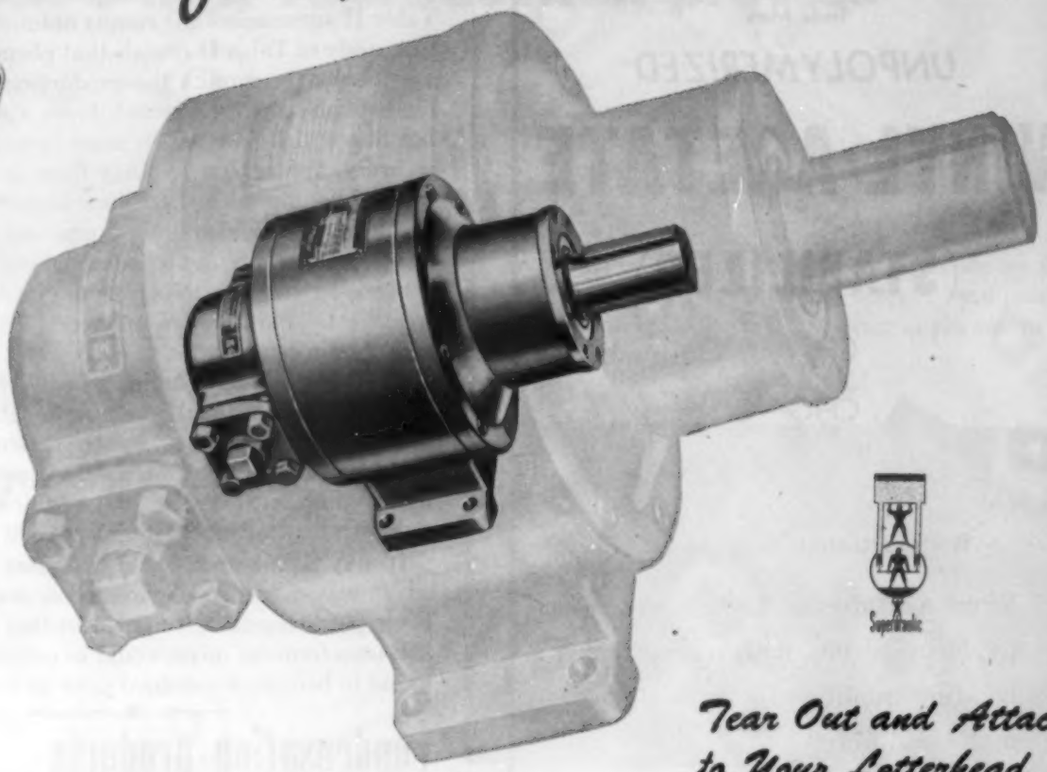

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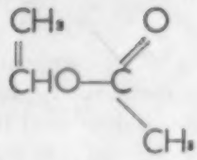

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original dimension. The samples were redried, first by air drying and then by oven drying, and again measured in thickness. The percentage dimensional change between this final oven-dry thickness and the original calculated oven-dry thickness is a measure of the amount of recovery from compression due to soaking. Table II summarizes the results obtained.

A study of Table II reveals that phenolic-resin treatment not only permits the production of compreg of high specific gravity at much lower applied pressures, but also stabilizes it much more against swelling and recovery, and against recovery from compression when exposed to moisture than does urea-resin treatment. Of the two urea resins studied, urea-formalin treatment gives considerably better dimensional stability and plasticizing action than does dimethylolurea-resin treatment. Part of this difference may be due to a higher resin content.

The use of a milder drying schedule (lower temperature for a longer time) would undoubtedly cause less precure of the urea resins, but the dimensional stability of the final compreg, as was shown in a previous study,[1] would still be only one-half to two-thirds as good as for compreg made from material treated with phenolic.

It may thus be concluded that urea resins have no advantage over phenolic resins in making compreg. From plasticity data, it is evident that dimethylolurea and urea-formalin mixes would be inferior to urea alone as aid to bending wood dried prior to heat bending.

Condensation products

(*Continued from page 162*) or acetylenediurea—has aroused considerable interest. It gives a very stable tetramethylol compound which is easily water soluble and produces, by acid condensation in aqueous solution, resins which are slightly water resistant. The value of the tetramethylol compound is in the fact that the methylol groups easily form ethers with alcohols. Thus in acid condensation with monoalcohols, soft to hard resins are produced which, according to the tests of the Color Division in Ludwigshafen, are compatible with cellulose esters and are similar to Uresin B. The compound seems to react easily with the hydroxyl groups of cellulose itself, so that the product may offer some interest for the improvement of cellulose.

The tetramethylol compound has been used successfully under the designation "Lu-Ho 3/140" as a textile intermediate to improve hand, to prevent shrinkage and to impart crease-resistance. A condensation product of tetramethylolacetylenediurea and octadecyl or fatty alcohols from paraffin oxidation, which is produced in the presence of methylpyrrolidone or dimethylformamide, is easily dispersible in water. A patent application (Lu 3/158) is pending for its use as a hydrophobic agent based on experiments by Dr. Lintner, Ammonia Laboratory and Dr. Leupin, of the Color Division.

In repeating the work of Kadowsky[1] on intermediate products in urea-formaldehyde resin formation, several

[1] Bull. Chem. Soc. Japan *11*, 248–261 (1936).

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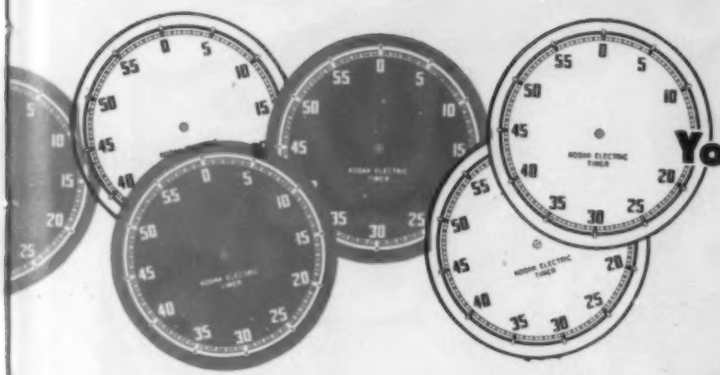

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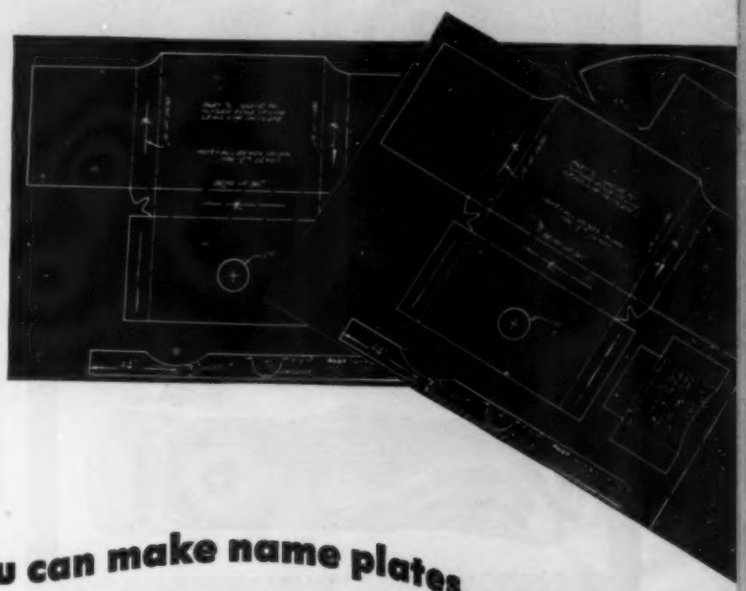

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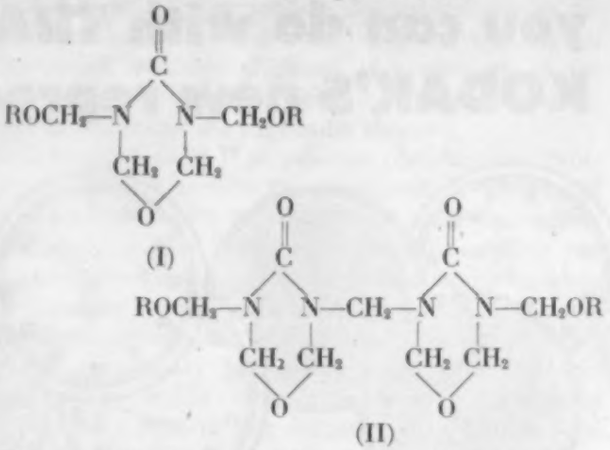
practical methods for making Uron ethers were found. These ethers have the following structures:



(I)

(II)

They are thin to glycerol-like liquids which cannot be hardened under normal conditions but can very easily be converted to higher ethers with higher boiling alcohols. If alcohols with at least two hydroxyl groups are used for this purpose, resins varying from hardenable to non-hardenable types can be produced. Products of this kind are now being investigated.

Photodielectric analysis

(*Continued from page 164*)

Figure 6 shows the stress pattern when viewed endwise in polarized light. Once again, the test specimen is cast phenolic plastic. The dark jagged area at the center portion is indicative of the irregular path pursued by the electrical current at the time of failure.

Figure 7—Two pictures show result when dielectric failure took place through relatively narrow test specimen. The relief of stress one min. after failure can readily be observed.

From these illustrations the possibilities of photodielectric analysis can be established. With this useful tool it should be possible to further our knowledge of solid dielectric materials. It should be emphasized that in conducting examinations of this nature, low voltage

6—This end view of a cast phenolic test specimen as it looks in polarized light illustrates the stress pattern

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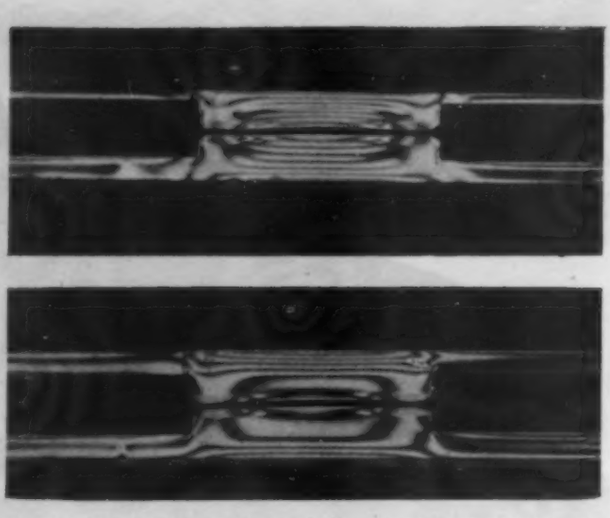

7—Top view shows dielectric failure taking place through a relatively narrow test specimen. Lower picture reveals the effect of relief of stress one minute after failure

stresses do not give rise to significant patterns, and the voltage conditions which give the best results in these tests are near the dielectric strength rating of the plastic.

Plastics Products Addresses (pages 113 through 120)

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Stock Mold Addresses (page 196)

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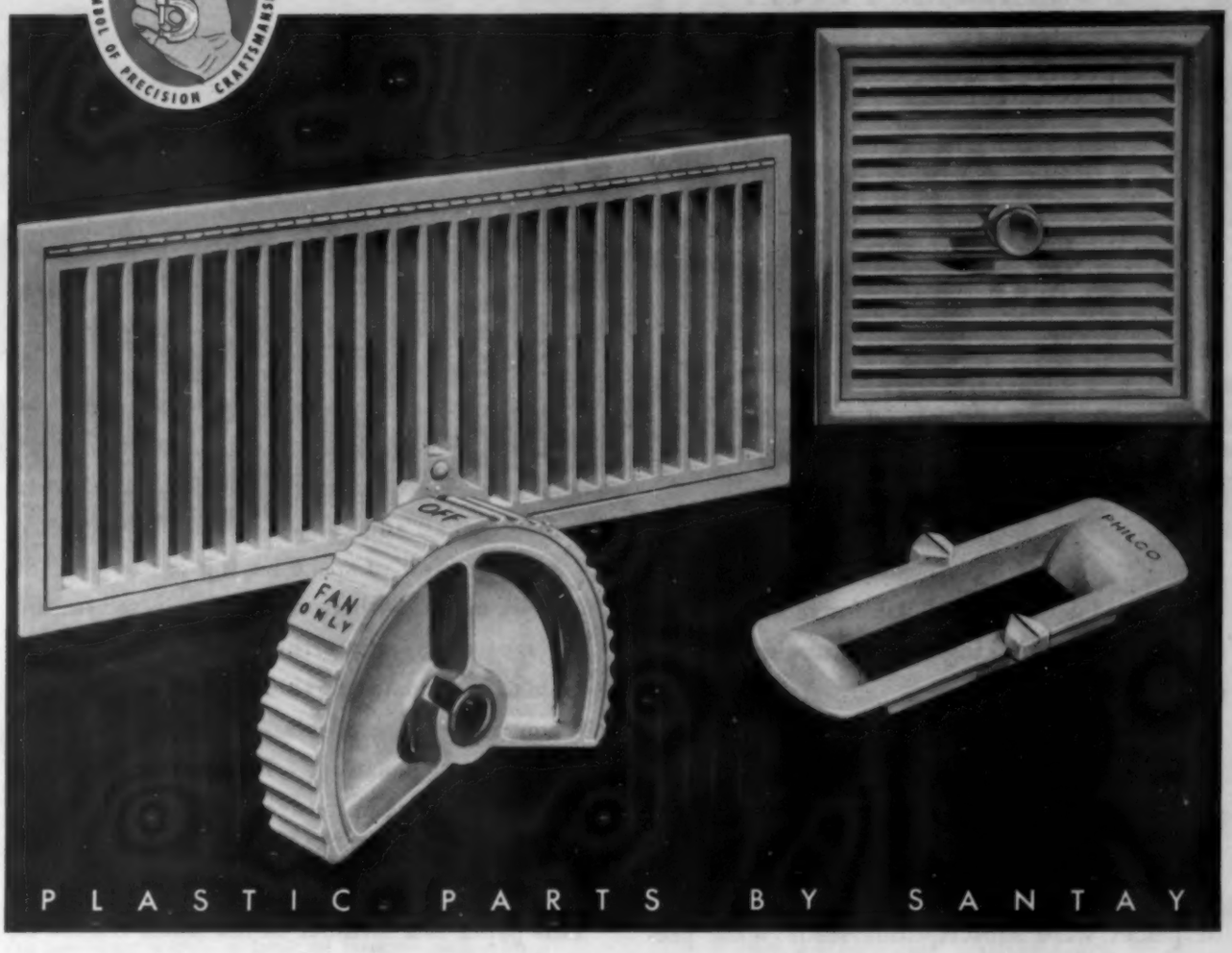

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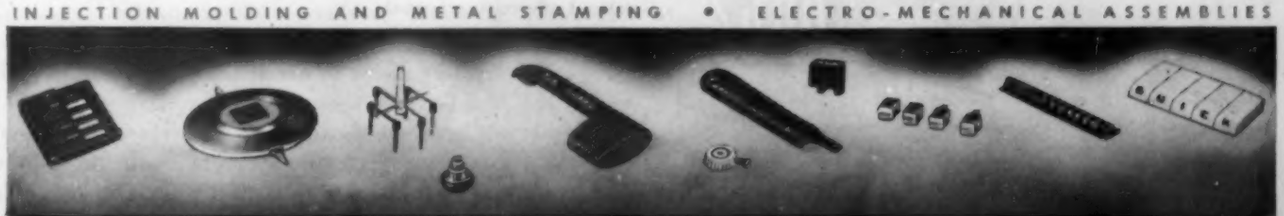

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How much paid circulation (how many people have expressed interest in the publication by paying for it)? How much unpaid? Who are the paid subscribers—what occupation or business? How was the circulation obtained? At what price or prices were subscriptions sold? What premiums, if any, were used as circulation inducements? How many subscriptions in arrears? What is the renewal percentage? Where does the circulation go?

Factual-minded space buyers find the answers to these questions in reports issued by the Audit Bureau of Circulations, a cooperative association of 2800 publishers, advertisers and advertising agencies in the United States and Canada. The circulation records of A.B.C. publisher members are audited once a year by a staff of experienced circulation auditors, and the information thus obtained is issued in easy-to-read A.B.C. reports available to all advertisers.

Another kind of space buying is the GUESSWORK method where media is selected on the basis of opinions-without-facts, unverified claims, inadequate and sometimes obsolete data. When advertising is bought by guesswork it becomes a speculation, a hit-or-miss operation that has no place in modern business.

Start your advertising on the way to success by using the FACTUAL method of space buying. This paper is a member of the Audit Bureau of Circulations. Ask for a copy of our A.B.C. report and then study it.

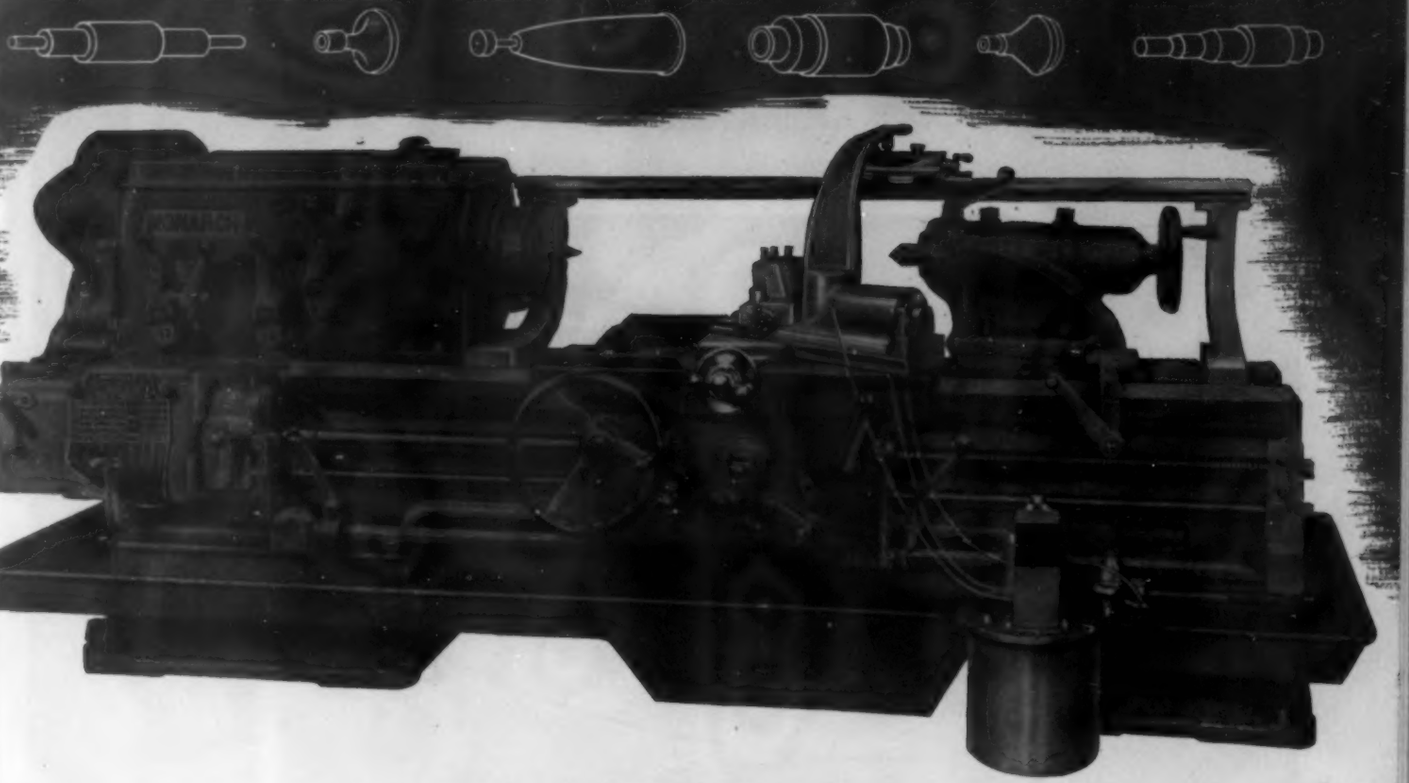
SEND THE RIGHT MESSAGE TO THE RIGHT PEOPLE

Paid subscriptions and renewals, as defined by A.B.C. standards, indicate a reader audience that has responded to a publication's editorial appeal. With the interests of readers thus identified, it becomes possible to reach specialized groups effectively with specialized advertising appeals.

MODERN PLASTICS

ABC = *AUDIT BUREAU OF CIRCULATIONS* = *Facts as the Basic Yardstick of Advertising Value*

FOR TURNING CONTOURS AND STEP SHAFTS



THE NEW EXCLUSIVE

MONARCH "AIR-TRACER"

FORMERLY KNOWN AS THE BAILEY DUPLICATING ATTACHMENT

Stepless increasing contours—machined to correspond to the template within a limit of tenths—and with a continuous finish that often eliminates subsequent grinding operations!

That's the kind of work you can do—*and faster*—with a new Monarch "AIR-TRACER" equipped lathe. You'll get greater precision—*greater production*—on increasing contours and on step shaft work, too. (Automatic sizing is an important integral feature.)

The "AIR-TRACER" has a proved production record for saving time, money and material on such diversified work as mandrels, punches, dies, nozzles, spinning chucks, impellers, valves, metering pins, molds—*and a wide range of step shafts.*

If you're doing these classes of work, you'll want to know all about the new Monarch "AIR-TRACER", offered exclusively on new Monarch Turning Machines equipped at the factory. You can get complete, detailed information in Bulletin 2601. Ask for your copy.

Check these advantages

- ★ **Stepless cutting-tool motion—*for increasing contours and a superior continuous finish.***
- ★ **Air-gage sensitivity combined with hydraulic power's versatility and ease of control—*an exclusive Monarch feature.***
- ★ **Automatic sizing eliminates repetitive setups and measurements—*for faster production, fewer rejects.***
- ★ **Continuous feed of slide on increasing diameters—*for more uniformly high finishes.***
- ★ **Exact conformance to template contours—*changes in template shape translated instantly into slide movement.***
- ★ **Feed infinitely variable from 0 to 20" per minute—*for maximum machining efficiency on all materials and diameters.***

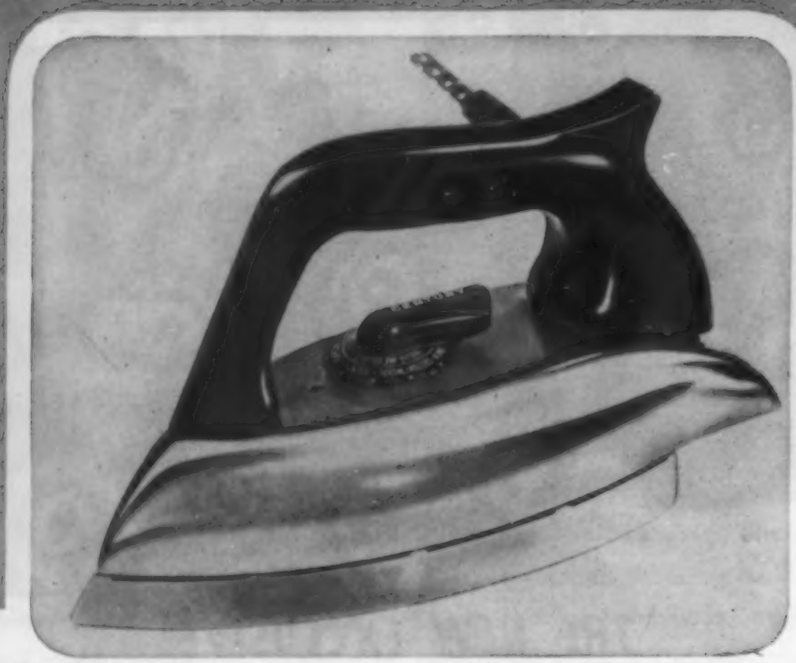
ACCURACY · ECONOMY · LONG LIFE

THE MONARCH MACHINE TOOL CO.

Sidney, Ohio

Monarch TURNING MACHINES

SHAW-MOLDED FOR IRONING COMFORT



Electrical appliances need personality. Right off they have to say, "I can make the job easier." The Shaw-molded plastic handle for the "Glide-O-Matic" iron produced by Century Precision Works, Inc., has the appearance, design and "feel" to put this message across emphatically. It's molded with Shaw precision and attention to detail.

Transfer molding was the obvious process for this handle, and a general purpose phenolic was selected as the material. Use of the Transfer molding method reduces cost to the minimum for a piece of this type and gives maximum production from the mold investment. In addition, it produces a molded piece with improved surface texture and high gloss finish—important factors in electrical appliance design and construction.

It's good policy to consult Shaw on your molding jobs. Shaw experience, extending over a half-century, assures you of the right combination of materials and molding techniques for the best product at the lowest production costs.

SHAW

SHAW INSULATOR COMPANY

MOLDERS SINCE 1892

160 COIT STREET IRVINGTON 11, N. J.

PLASTICS LITERATURE AVAILABLE

Shaw engineers have prepared a variety of literature, study of which might help you to a decision. Simply write a note about what phases of plastics especially interest you.

Or, you may prefer at once to call in a Shaw engineer, and present your problems for his study. This company's fifty-five years of plastics experience gives him a rich background from which you can draw.

Between the resources of Shaw and the Plax Corporation, Hartford 5, Conn., you can obtain assistance in almost all plastics methods and materials.

PLAX POLYETHYLENE IS A DESIGNER'S PLASTIC

Designers seeking to use plastics have in Plax Polyethylene a material that combines versatility in form and color with outstanding physical properties. Translucent and waxlike in appearance, it is available in film, slab, rod, tube, fiber and blown ware forms. It can be obtained in all colors from clear to pearlescent.

Plax Polyethylene is unaffected by acids, alkalis, alcohols, and only slightly affected by esters and ketones. It may be stretched readily without a plasticizer, but has poor elastic memory. It possesses exceptional electrical properties and high resistance to moisture. These advantages, plus its toughness, make it a plastic that designers can adapt to a wide range of uses—it is a designer's plastic.

PLAX PRODUCTION AND LITERATURE

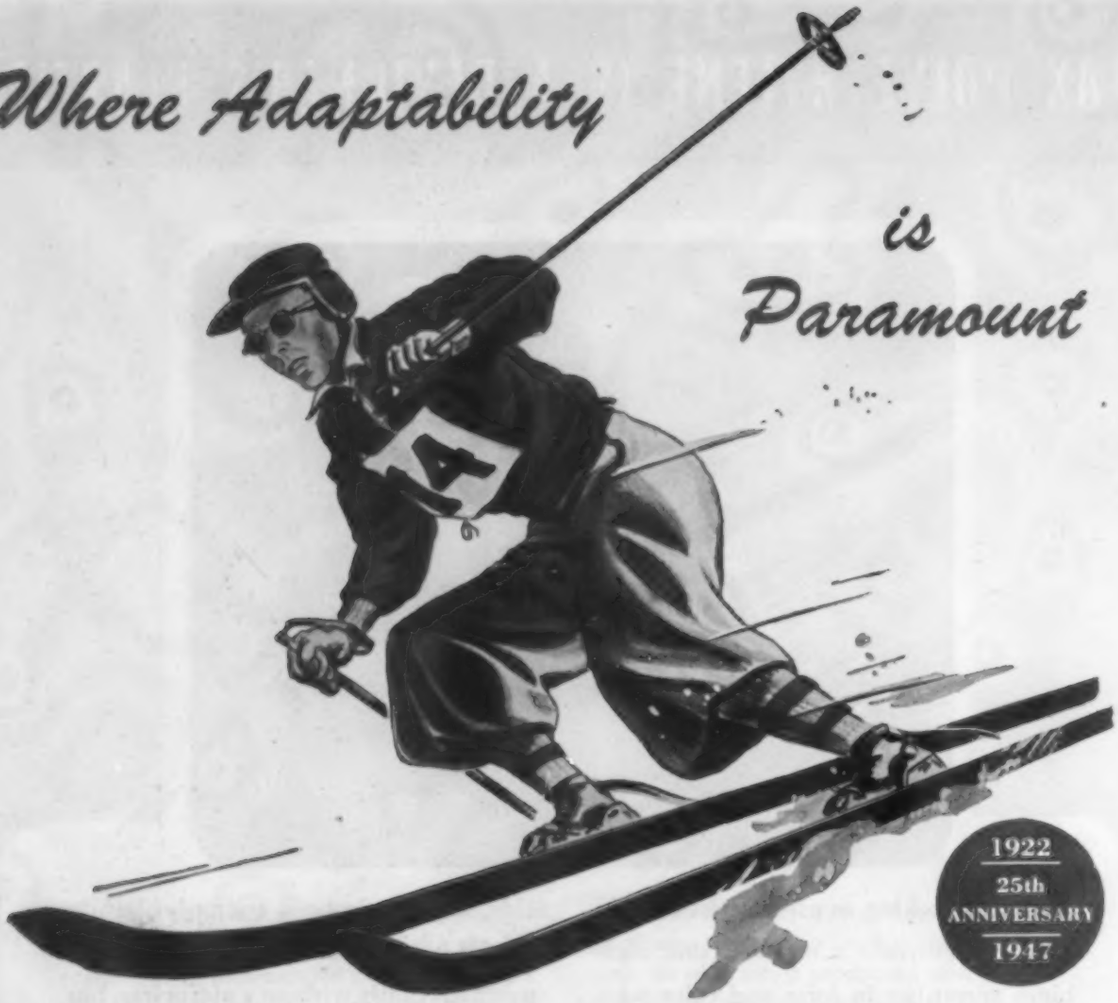
Plax is a leading source of plastics in sheet, rod, tube, and fiber forms. Plax materials are also available in special extruded shapes, as machined parts, and as blown ware. Among the materials fabricated in these forms are Polystyrene, Polyethylene, Ethyl Cellulose, Methacrylate, Cellulose Acetate, and Cellulose Acetate Butyrate. (Not all materials are available in all forms listed.)

Plax and the Shaw Insulator Company, Inc., Irvington, N. J., are able to provide you with expert help and counsel in the use of plastics including almost all materials and processes. You will also find valuable the broad range of free technical literature available from Plax. Write Plax for technical data on any or all of the above materials.

PLAX
FOR PLASTICS
NOT SUBSTITUTES··· IMPROVEMENTS

133 WALNUT STREET ★ HARTFORD 5, CONNECTICUT

Where Adaptability is Paramount



1922
25th
ANNIVERSARY
1947

GERING MAKES PRIME POWDERS *too!*

Did you know that GERING is also a source of supply for Prime molding Powders in a wide range of color.

Mention desired end-use, and we'll gladly quote.

GERING DEMONSTRATES EXCEPTIONAL VERSATILITY...

In converting scrap and residues of Plastic to a high re-use standard, GERING draws on a resourcefulness that only many years of patient research provides. It takes a touch of Transmutation to determine a *better* process; to develop extra stability when plastics are reprocessed.

GERING methods have proven Gering's ability to do an outstanding job in vitalizing plastic waste for your account. We'll gladly BUY your scrap, if you prefer!

Write us for details; or

Telephone: CRanford 6-2900

REJUVENATORS OF THERMOPLASTIC *Scrap*

CELLULOSE ACETATE—BUTYRATE—VINYL—ETHYL CELLULOSE—POLYSTYRENE

GERING PRODUCTS, Inc.

NORTH SEVENTH ST. KENILWORTH, N. J.

"Masters of Magic in Thermoplastic conversion"

"APPROXIMATELY 75% in assembly time is saved in applying the blade and backing plate to this cellulose acetate butyrate case of the Leader Dispenser by the P-K 'short-cut' method," reports the Pacific Mfg. & Eng. Corp. "It's the only practical method." Two 4x¼ Type "U" Drive Screws anchor parts fast. Holes for screws are molded . . . stainless steel blade and back-up plate, pre-punched.

USING machine screws in tapped holes to fasten the blade and back plate of the plastic Leader Dispenser promised trouble . . . extra, needless operations, tap breakage, cross threading, screws working loose.

To avoid time-consuming tapping and all its complications, the manufacturers chose P-K Self-tapping Screws. Fastening became the *simple* job of driving the screw in a plain, untapped hole.

Used by thousands of other plastic product makers, this "short-cut" method not only eliminates tapping, but also saves costly operations for inserts, and other complicated methods. It permits better product design, stronger assemblies, too . . . with savings in assembly time up to 50%.

Common sense assembly engineering points to P-K Fastening for 7 out of 10 product assemblies . . . whether *plastic, metal, or wood.* Isn't it worthwhile to find out if you can avoid needless fastening troubles and expense? Ask a P-K Assembly Engineer . . . or send assembly details. Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

Sold Only Through Accredited Distributors

P-K

PARKER-KALON SELF-TAPPING SCREWS

A FASTENING FOR EVERY METAL AND PLASTIC ASSEMBLY

THE ONLY ENCYCLOPEDIA OF

TO BE

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- UP-TO-THE-MINUTE DIRECTORIES.
- COVERING EVERY ANGLE OF THE PLASTICS MARKET.

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(including duty and shipping)
$12.00 per copy Foreign

Please send remittance with order

CORPORATION

NEW YORK 17, NEW YORK

PLASTICS IN THE WORLD

1947 MODERN PLASTICS *Encyclopedia*

PUBLISHED SOON

THIS year, more than ever, the MODERN PLASTICS ENCYCLOPEDIA will be the one and only authoritative reference book of the plastics industry in the world.

Larger, more elaborate and complete than any of its predecessors, the 1947 MODERN PLASTICS ENCYCLOPEDIA will be published in 3 volumes (sold as a unit) for ease in handling. Like its famous predecessors, the 1947 Encyclopedia will be the source book, hand book and guide book of plastics.

Containing 136 separate chapters, the new edition of the MODERN PLASTICS ENCYCLOPEDIA will reflect the increasing scope of the plastics industry, incorporating all of the advances which have been made in plastics during the preceding year—in materials, machinery and techniques.

Cross-indexed for handy reference, the 1947 edition will also contain the special charts which are in constant demand for valuable information on plastics properties, solvents, plasticizers, synthetic rubbers, etc. Complete up-to-the-minute directories to every branch of the plastics industry include molders' marks, trade names, raw materials, manufacturing facilities of molders, laminators and fabricators as well as a bibliography of plastics publications, glossary of terms and list of educational institutions offering plastics courses.

In short, the 1947 MODERN PLASTICS ENCYCLOPEDIA will be an entire compendium of the plastics industry—a book you cannot afford to miss. . .

ORDER YOUR COPY NOW!

PLASTICS CATALOGUE

122 EAST 42ND STREET

Prominent among the high quality basic materials relied upon heavily by industry is the broad line of Witco chemicals. *Quality-controlled*, every Witco basic material gives consistently good results at an economical cost . . . each one contributes something of fundamental importance to a finished product's character.

Count on Witco—come to Witco—for basic materials especially made to help give your products a decided advantage in performance and acceptance during the busy, highly competitive years that lie ahead.

WITCO CHEMICAL PRODUCTS FOR THE PLASTICS INDUSTRY

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ON LAND...IN THE AIR... ...ON THE SEA

• It's Plyon. Yes, the applications of Plyon are virtually legion. Every day new applications of this versatile laminate are brought to our attention--applications that ultimately provide a new problem for us to solve.

• For instance, Plyon, consisting of woven fibreglas cloth as a base material, is ideally suitable for a number of applications in the field of transportation. Plyon is practical for kickplates and side panels in trucks, buses and taxis. Trains, too, can make good use of Plyon for scuff panels and surfaces that get hard wear Steamships and aircraft find numberless applications for Plyon --in baggage compartments, as cargoliner panels, kickplates and side panels or for any surface that requires high tensile and impact strength. Varied formulations of Plyon provide almost any degree of strength and toughness

• In fact, Plyon has many more assets to recommend it for these applications--such as low moisture absorption, resistance to most acids, solvents and alkalis. And something else. Plyon is self-extinguishing for fire resistance. The range of Plyon is from complete rigidity to complete flexibility and most important, Plyon is available immediately

• If any of these suggested uses of Plyon fit into your plans, write and tell us your requirements. We'd like to help solve your problem with Plyon.

Swedlow PLASTICS CO.

5531 District Boulevard • Los Angeles, Calif.

Sub-Zero Plastics tests at JOHNS HOPKINS University Research Laboratories *with* OLSEN PLASTIVERSAL

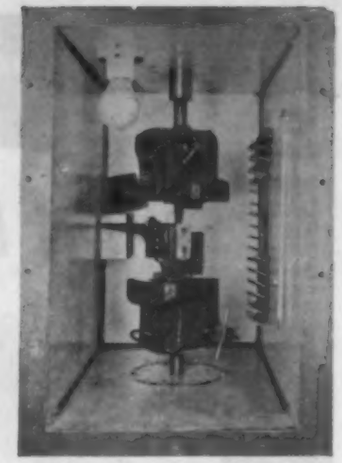
The Laminated Plastics Test Project operated at Johns Hopkins University, in Baltimore, Maryland, has conducted over 5000 tension, compression, and flexure tests at temperatures ranging from — 100° F. to + 200° F. with the Olsen Plastiversal Testing Machine illustrated here.

This project, sponsored by National Electrical Manufacturers Association, is under the direction of Dr. Ralph K. Witt, who devised the special low temperature testing techniques shown.

The Olsen Plastiversal Testing Machine is equipped with an Olsen Electronic High Magnification Recorder which produces, in chart form, an accurate stress-strain diagram of each test made. The specimen is placed in the tension, compression, or flexure clamps, with extensometer attached — all in the temperature controlled cabinet. The machine is put in operation and every step in the physical change of the specimen during the test is transmitted electronically to and recorded on a letter size chart for permanent record and subsequent study.

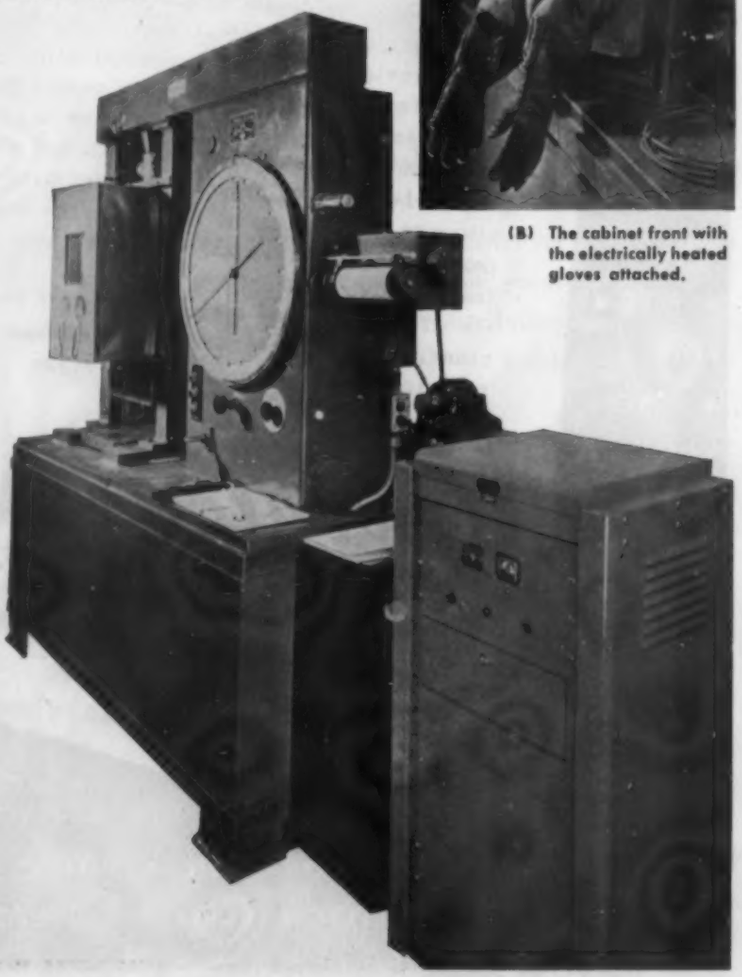
The high accuracy, ease of operation, and dependability of this equipment is an invaluable aid in the comparison, standardization, control, and development of plastic materials.

The Olsen Plastiversal has been designed especially to meet the needs of the Plastics industry — it is but one of a number of perfected testing instruments for both laboratory and production use. We will be pleased to send complete details on Olsen Plastics Testing Equipment — Write today for Bulletin No. 23.



(A) Interior of low temperature cabinet showing sample racks and tension grips with extensometer attached.

(B) The cabinet front with the electrically heated gloves attached.



OLSEN

Testing & Balancing Machines

TINIUS OLSEN TESTING MACHINE CO.

500 North Twelfth Street, Philadelphia 22, Pa.

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Service is speed in good workmanship
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Molders of Plastics
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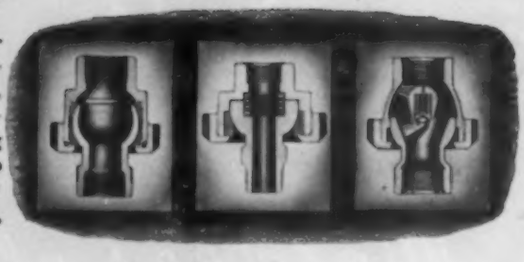
SPI
GENERAL MOLDED PRODUCTS · INC
OFFICE AND PLANT · DES PLAINES · ILLINOIS · Suburb of Chicago

VIBRATION GIVES THE PITCH IN A TUNING FORK

but gives trouble in fluid lines

Vibration serves a useful purpose sometimes, but in a fluid-conveying system it is a destructive force. Barco Flexible Joints, for thirty years past, have provided protection for fluid lines in an ever-expanding range of industrial and transportation services. These expertly engineered joints allow responsive movement in any direction, absorbing shock and strain, compensating for expansion and contraction, insuring full fluid-carrying capacity. Write for complete engineering data on this famous line. Barco Manufacturing Co., Not Inc., 1809 Winnemac Avenue, Chicago 40, Illinois.



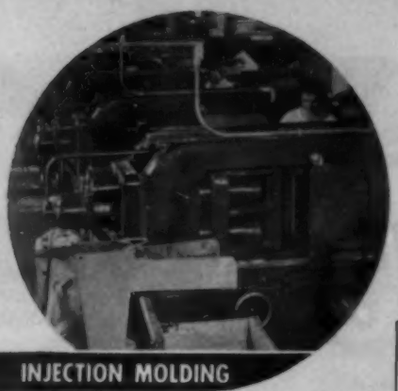
BARCO FLEXIBLE JOINTS

Not just a swivel joint ...but a combination of a swivel and ball joint with rotary motion and responsive movement through every angle.

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY

In Canada: The Holden Co., Ltd., Montreal, Canada.

"MOVE IN EVERY DIRECTION"



INJECTION MOLDING

A battery of over 50 presses (8 to 24 oz.), offers you capacity and range for any type of application.

EXTRUSION MOLDING

Hardy's modern extrusion molding facilities economically produce parts to your specifications in rigid or flexible materials.

Custom Molding EXPERIENCE

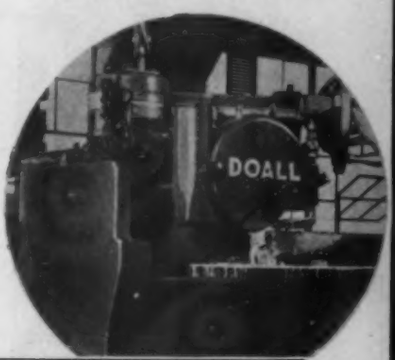
In custom molding there can be no substitute for experience. The skilled engineering, design and mechanical staff at Hardy has a background of over 20 years of experience in working with both metals and plastics. Our mold-making department, completely equipped with every type of modern machine tool and staffed by the finest craftsmen, is geared to build precision molds for all types of injection and extrusion parts or products.

Add to this fund of experience and skills *complete* facilities — a battery of over 50 injection presses (8 to 24 oz.), a complete extrusion department *plus* finishing and fabricating departments for both metal and plastics assemblies, and you have at your disposal a complete custom molding service, all compactly housed in the 7-story Hardy plant.

The tremendous capacity of Hardy, backed up by an unrivalled experience that guarantees you quality workmanship, can bring you a quick solution of your plastics problems now! Quotations on molds and molding costs will be supplied promptly upon submission of blueprints or models of your new application. Inquiries invited!

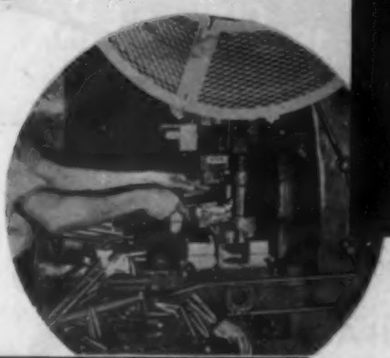
HARDY PLASTICS & CHEMICAL CORP.

ONE JUNIUS STREET, BROOKLYN 12, NEW YORK



TOOL AND DIE PRODUCTION

he most modern machine tool equipment, manned by skilled craftsmen, means precision molds built to rigid specifications.



METAL STAMPING

Over two floors of the Hardy plant are devoted to metal stamping, finishing and plating operations.

FINISHING AND ASSEMBLY

Speedy small assembly operations of plastics and metals are facilitated by Hardy's ingeniously designed jigs and fixtures.

PLASTICS FABRICATING

Hardy's fabricating department specializes in speedy short runs of intricate shapes in acrylics, cast phenolics and styrenes.

Let us advise you with regard to material and method.

Through close attention to the needs of our customers we have created a service that we feel merits your confidence. We should appreciate the opportunity of working with you toward the solution of your particular molding problem.

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TRENTON 2, NEW JERSEY
NEW YORK OFFICE—1182 BROADWAY
Plastics PHENOLIC • UREA • CELLULOSE ACETATE MATERIALS

UNIFORM GRANULATION of SCRAP ASSURES UNIFORM MOLD FLOW...

The American KC Grinder Rapidly Reduces Sprues, Gates, Rejects to Homogenous Granules

Illustration above shows sample of acetate sprues, gates, and rejects, reduced by the American KC Grinder to uniform granules with inconsequential fines.

Scrap is reduced to homogenous granules to assure uniform mold flow.

Hinged, smooth contour crushing chamber permits easy cleaning for changes without contamination. Heavy all-plate construction prevents serious damage from inserts and tramp metal.

Send for bulletin "Grinding Plastics Scrap Profitably"

American PULVERIZER CO.
Originators and Manufacturers of Ring Crushers and Pulverizers
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St. Louis 10, Mo.

Revolutionary NEW WAY to Control DRILLING SPEEDS

New Instant SPEED CHANGER with QUADRILL— 4-position Drill Head

NOW—a quick, positive way to insure correct, efficient drilling and tapping speeds. Instant SPEED CHANGER, with just a touch of a lever, gives you slow speeds for tapping and a change of speeds for large and small drills—the proper speed for the job. Eliminates cumbersome and often unused belt changes. . . . QUADRILL, the 4-position drilling and tapping turret head for all drill presses, provides 4 operations on 1 spindle. Speeds operations. Cuts production costs.

SPEED CHANGER and QUADRILL sold as unit or separately. Specify size and make press and motor shaft diameter.

Write for literature and prices

CHICAGO DRILLET CORPORATION
1741 N. Winchester Ave., Chicago 22, Illinois

DEPENDABILITY!

● If anything *must* be dependable, it's a fire-alarm box.

One of the oldest manufacturers of fire-alarm equipment in the United States has for years entrusted to Insulation the molding of these plastic parts—which play a major role in ensuring the dependability of this vital equipment.

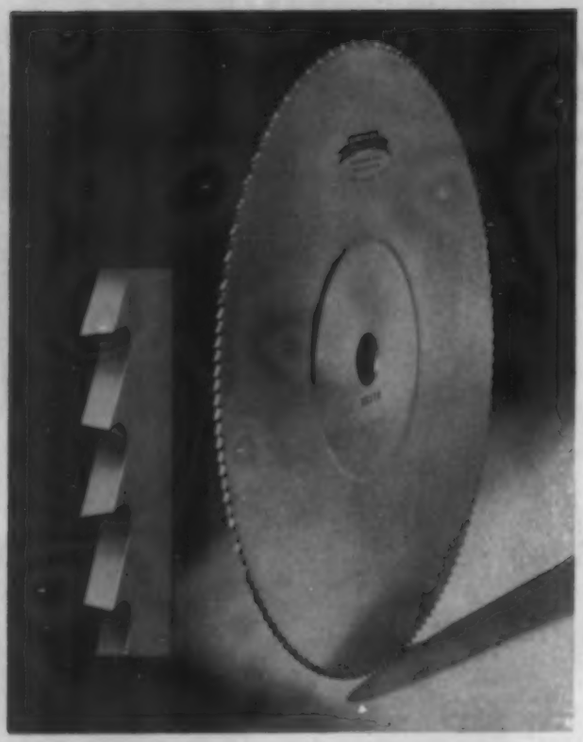
It's another in the long line of successful molding jobs performed by Insulation Manufacturing Company for the largest companies in America.

Molded for
The Gamewell Co.
Newton, Upper Falls, Mass.
1—Fire Alarm door
2—Mounting board

INSULATION MANUFACTURING CO.

Custom Molders of Plastics for Industry

11 New York Avenue Brooklyn, N. Y.



SIMONDS

Solid Circular High-Speed Steel Saws

Cut Plastics More Smoothly... Stay Sharp Longer Under High Heat

You're looking at one of the most successful plastic cutting saws made .. concave-ground for ample clearance, and hardened so it can be resharpened with file or grinding wheel. It's made of Simonds special high-speed saw steel which contains extra vanadium for better cutting qualities under heat, and for longer life. There are other Simonds Circular Saws, too . . . made with tungsten carbide-tipped teeth, made of semi-high-speed steel, special alloy steel, and Simonds T-11 "self-lubricating" Steel. Also, there are:

SIMONDS BAND SAWS with teeth set evenly on both sides of blade for easy running and clean cutting. *3 types:* Regular Hard Edge, Spring Temper . . . and the "Skip-Tooth" which is specially adapted to plastic-cutting because of its extra gullet-capacity for large, soft chips.

Send for this Free Book: Tells you how to choose and use the right saws for every plastic-cutting job... tells how to cure and avoid sawing troubles. Write for your copy today.

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Wash. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

Then you'll want to investigate *Ferro's inorganic colors*—ideally suited for compression and injection molded plastics. Select from full color range. Colors stable (to 2300 degrees Fahrenheit) and highly chemical-resistant. Write for further details and samples.

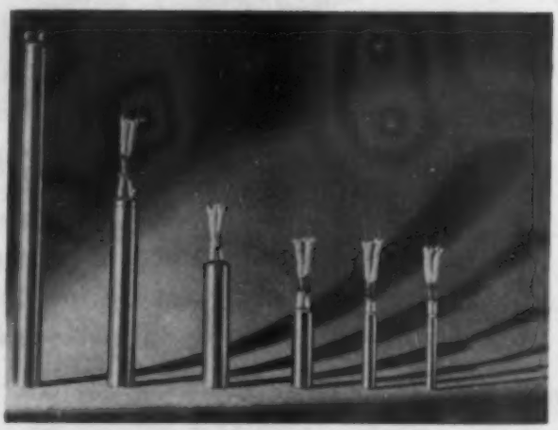
Color Division

FERRO ENAMEL CORPORATION

4150 East 56 Street *Cleveland 5, Ohio*

ELECTRIC HEATING EQUIPMENT

for the Plastics Industry



CARTRIDGE UNITS (illustrated) widely used for heating of: Plastic Molds, Platens, Dies, etc. Size and Wattage to your specifications. Also Space, Strip, Band, Hinged Type Band and Immersion Heaters—for the Industry. We manufacture Hot Plates and Ovens as well. Let us solve your heating problems.

SEND FOR OUR NEW ILLUSTRATED CATALOG

GLENN ELECTRIC HEATER CO.

239-241 Canal Street New York 13, New York

THE INJECTION PROCESS OF FABRICATING THERMOPLASTICS FOR SPEED, PRECISION AND ACCURACY

PLASTIC BINDING SCREWS

7/32-inch diameter screws in ¼", ⅜", ½", ⅝", ¾", ⅞" or 1" lengths.
5/16-inch diameter screws in ¾", 1", 1½", 2" or 2½" lengths.
Furnished in either clear or black. Write for prices.

IMCO

INJECTION Molding COMPANY

3823 INDEPENDENCE AVENUE, KANSAS CITY 1, MISSOURI

ALPHA

HYDRAULIC REDUCING VALVE

ALPHA High Pressure Reducing Valve for water. Designed for max. 3000 lb/in.² (200 kg/cm²). Allows any pressure to be obtained on the molding press down to 25%. Of value especially in transfer molding and when applying high frequency preheating.

Reduces maintenance costs for molds.

Write for particulars to

AKTIEBOLAGET ALPHA

Sundbyberg Sweden

Keep This Tested and Proven War-Time Veteran on the Job

In many plants TARBONIS (Liquor Carbonis Detergens in a vanishing type cream, odorless, greaseless, stainless) during the war period has proved a real aid against the occurrence of dermatitis due to urea and phenol formaldehyde resins and powders, in addition to many other plastic compounds. Let it aid your peace-time production. Your plant physician knows also how effective it has proved in clearing up many stubborn skin conditions encountered in industry. Discuss TARBONIS with him, and use the coupon for a generous sample and literature.

THE TARBONIS COMPANY

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By.....*Dept*.....

LABORATORY Mills & Presses

The EEMCO Laboratory Mill is entirely enclosed, ready to operate. It is equipped with built-in motor, control and variable speed drive. Mechanism readily accessible.

The 12" x 12" EEMCO 42-ton Laboratory Press is furnished with self-contained hand pumping unit, air operated fast closing, steam or electric platens, adjustable opening from 6" to 18".

Both Mill and Press are designed for research, development and small scale production.

Bulletins and additional detailed description on any EEMCO products will be sent on application . . . Early deliveries now.

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THE ANSWER to PLASTIC SLITTING CUTTING SHEETING PROBLEMS

CEE-BEE is the answer—we do slitting, cutting and sheeting of all materials—including cellophane, acetates, etc., from 1/16 inch to 75 inches in width.

Equipped to slit up to 100,000 yards per day, we offer prompt and reliable service. Storage space is now available; we are equipped with railroad siding.

We also interleave plastics. Bring your slitting, cutting, sheeting problems to us.

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Your Best Answer is *Dillon*

Remote reading Tens-O-Trol indicates weight or tensile pull.

Traction Dynamometer for all types of load measuring applications.

Mechanical pressure gauge indicates pressure in vises, presses, etc.

Model K Universal Tester for transverse, shear and tensile, compression.

DILLON STAINLESS STEEL THERMOMETER

A precision instrument available with 3" or 5" dial and in 0-200, 50-500, 150-750, and 200-1000 degrees F. Pressure-proof, moisture-proof, rugged construction. ½" standard pipe thread connector. 5" and 9" stems standard —extra long stems to order. For ovens, kettles, air conditioners, diesel engines, etc. Light weight, economical. No linkages, no gears. Accurate to 1% of range over entire scale. Can be supplied with lucite crystal if required. Prompt shipments!

W. C. Dillon & Co., Inc. *specializes* in precision testing equipment of a diversified nature. These outstanding products are used by leading concerns in virtually every type of industry. *Temperature* measurement, *pressure* indication, *physical strength*, *weight* indication, *tension* indication—all are easy with Dillon instruments. And, prices are economical. Dillon engineers will gladly assist in adapting this equipment to your problems. No obligation. Delivery of all Dillon products is prompt. Catalogs, folders and photographs are available on any of the above products. Write today specifying products you are interested in!

Look to Dillon for the unusual in precision test equipment!

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PLASTIC MOLDS

25 years experience in designing and building molds for leading molders.

Our plant is modern in equipment for producing the best in molds. Compression, Injection, Transfer.

Now equipped with an eight-ounce injection machine for testing molds!

SOCIETY OF THE PLASTICS INDUSTRY · SPI

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Dealers in PLASTICS SCRAP

MEYER & BROWN CORP.

Founded 1894

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Here's the Key to your molding problem

The key to any problem can best be found by those whose "know how" is a direct result of years of practical experience. That's why KUHN & JACOB can be the key to your problem, for its principals are former mold-makers and tool-designers themselves and know the business from every angle.

They can give you expert advice in the selection of the proper material for your product, and thru their intimate knowledge of the problems of design, mold-making, and molding, will help give you a finished product that will meet every requirement.

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MOLDING & TOOL CO.

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Special Organic Peroxides

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TRADE MARK

LUCIDOL DIVISION

NOVADEL-AGENE CORPORATION
BUFFALO 5, NEW YORK

MISKELLA INFRA-RED
OVENS and APPLIANCES
SERVE THE PLASTIC INDUSTRY

Branch of the Industry	Name of Appliance	Use
MOLDERS (Thermoplastic) Injection	VIBRA-VEYOR (Variable heat)	To preheat plastic powder automatically. To dry plastic powder automatically granule by granule.
MOLDERS (Thermosetting) Compression	PELLET-VEYOR (Variable heat)	To preheat pellets and preforms at the press as needed.
INJECTION	HOPPER-HEATER (Variable heat)	To warm up heavy metals of hopper in molding machine.
MOLDERS (Thermoplastic) Extrusion	STRIP-HEATER (Variable heat)	To preheat strip rolls of vinylite, etc., automatically as fed to worm.
MATERIAL Manufacturers	Special production equipment including vibrators, conveyors, stainless steel belts and electronic devices	To process various kinds of plastic material in bulk quantities.
FABRICATORS (miscellaneous)	BENCH-KIT in various sizes (Variable heat)	To soften sheets, rods, tubes and shapes for bending, forming, punching, etc. This includes Cellulose, Acetate, Bakelite and Methyl Methacrylate.

• The time on most of the operations mentioned above averages five minutes •

THE MISKELLA *infra-red* COMPANY

DESIGNERS — MANUFACTURERS OF
INFRA-RED OVENS • APPLIANCES • SECTIONAL UNITS • MACHINES AND CONVEYORS

Main Offices and Laboratory
East 73rd and Grand Ave., Cleveland 4, Ohio

Each Press has an OVEN for a Partner
at Midwest Molding & Mfg. Co.

FASTER MOLDING
for BETTER QUALITY
LOWER COSTS

DESPATCH PLASTICS PREHEATING OVENS

For dependable, trouble-free preheating where job requirements are varied, you'll get excellent results immediately with a compact DESPATCH Oven . . . *placed right beside each press!* This method, recommended by scores of compression and transfer molders, is used at Midwest Molding & Mfg. Co., experienced custom molders in Chicago.

This assures an ever-ready supply of correctly heated material . . . requires no tedious adjustments or button-pushing . . . eliminates danger of over- or under-heating. Press operator can set his own molding cycle, merely removing preforms from oven drawer as needed, not before. *Amazingly convenient, practical, economical . . . first choice of countless shops* (names on request).

DESPATCH OVEN CO. 609-13 S.E. 8th St., Minneapolis 14, Minn.

DESPATCH PTHD-6 OVENS (6-drawer) at Midwest Molding & Mfg. Co. (Chicago). When in use, each oven is placed beside a compression molding press. Drawers are 12" x 12" x 2¾". Automatic thermostat control; heat range 100° to 450° F. Uniform forced-draft heat. *Complete range of drawer, flap-door and batch type ovens for ALL plastic requirements.*

WRITE TODAY for new illustrated catalog, photos, performance data.

DESPATCH OVEN COMPANY

PLASTIC MOLDS

We make superior, modern plastic molds that produce clean, uniform plastic parts.

- INJECTION
- COMPRESSION
- TRANSFER

Also — Hubs, dies, pantograph engraving, glass stone dies, glass stone molds.

Inquiries will receive prompt attention.

MAURICE A. GAGNON COMPANY
512 York Avenue Pawtucket, R. I. Tel.: Perry 2913

Cumberland Tool Works

ENGINEERS
DESIGNERS and
MANUFACTURERS OF:

Plastic Molds and
Die Casting Dies

Our thorough knowledge and complete experience of injection, compression and transfer molds, and die casting dies, is at your disposal.

We are equipped to handle any job.

No job is too large or too small.

1317 WEST GRAND AVE., CHICAGO 22, ILL.

CLEAR PICTURE of a bonding job well done WITH *Pliobond**

REQUIREMENT:
To Bond Clear Vinyl Film over Full Color Photograph on Plywood Backing. Transparency must be Absolute.

Whatever *your* adhesive requirements, consider Pliobond.

A glance at the record would convince you that "Pliobond bonds *anything to anything!*" Steel to glass. Aluminum to plastic. Ceramics to fabric. Rubber to wood, etc., etc.

A case in point is the requirement of the Cruver Manufacturing Co., Chicago, described above. Here, and in many other instances, Pliobond has proved exceptionally good for bonding vinyl resins.

Your specifications may call for resistance to oils, water or waxes . . . for high tensile or shear strength . . . flexibility . . . immunity to fungi . . . or some other special feature.

A note to us will bring you complete technical information on Pliobond's ability to solve your bonding problem. Or send the coupon for our new folder on this revolutionary new bonding agent.

Pliobond* is distributed exclusively by The United States Plywood Corporation, and is manufactured by The Goodyear Tire & Rubber Company.

*Trademark registered, The Goodyear Tire & Rubber Co.

UNITED STATES PLYWOOD CORPORATION
Industrial Adhesives Division: 55 West 44th Street, New York 18, N. Y.

Please send your free folder on Pliobond.

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M.P. 2-47

DETECTO SCALES

There's a precision-accurate Detecto Scale for your specific weighing and counting need. The Detecto helps increase production, yet assures you maximum accuracy by making slightest weight discrepancies immediately visible.

No. 1800 DETECTO-GRAM INDICATOR HEAD

One more Detecto weighing instrument to speed production. This attachment converts your present beam scales to accurate weighing equipment. Indicator stops instantly at correct weight.

Write for circular.

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MAKERS OF FINE SCALES SINCE 1900
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SCALE ENGINEERS IN ALL PRINCIPAL CITIES

AQUA PLASTIC DYE
Patent Pending

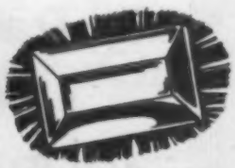
Here is a Permanent dye in Water solution! Developed especially for your clear plastics. *AQUA PLASTIC DYE has these outstanding features: (a) Ease of application—30 to 60 seconds immersion in 200° F water to which dye has been added (b) color deposits evenly (c) plastic retains polished luster (d) fire hazard eliminated (e) no unpleasant or toxic odors.*

GREAT AMERICAN COLOR CO.

2512 West Ninth Street, Los Angeles 6, California.

New York Rep: Plastics Dye & Supply Co., Ocean Gate, New Jersey. Chicago Rep: Acme Plastics Supply Co., 833 Chicago Ave., Evanston, Illinois

Also manufacturing a complete line of cold dip dyes.



AQUA PLASTIC DYES in 15 basic colors for any of 150 lovely pastel or brilliant shades in a matter of seconds. Highly recommended for methacrylates, nitrates, acetates, acetabutyrates, ethyl cellulose and vinyl chloride.

Other GREAT AMERICAN products include "GAMCO", a "non-burning" buffing compound for plastics; ANNEALING COMPOUND which creates a bond stronger than the plastic itself; LAMINATING COLORS, a cement with color — no air bubbles, no streaks.

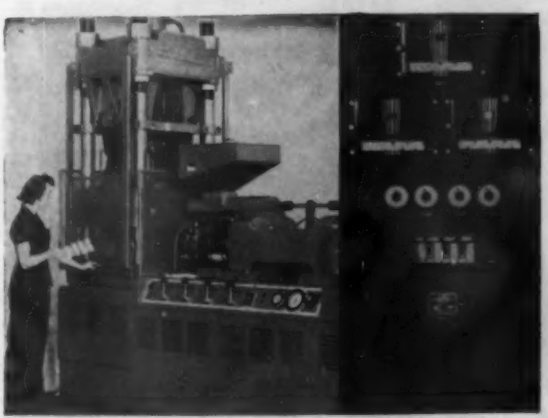
SPEED PRODUCTION • LOWER DYEING COSTS

Complete Line of
Machinery for Celluloid
and Plastics Mfrs.
JOHN J. CAVAGNARO
HARRISON Engineers and Machinists ESTABLISHED 1881 NEW JERSEY

Presses for Dehydrating Filtering, Caking, Polishing, Stuffing, etc.

Mixers: Plain or Stainless
Preliminary or Vacuum

MICROFLEX
TIMING
for MOLDING MACHINES



MICROFLEX timers and temperature control instruments in a unit assembly for injection molding presses mean

- Neat appearance
- Easier maintenance
- Reduced costs

Investigate the advantage of Microflex timers assembled into complete control panels.

EAGLE Signal Corp.
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Like the Butterfly
from the cocoon . . .

your products
emerge from
CONTINENTAL
CRAFTSMANSHIP
with radiant
plastic beauty

Ask for a representative to call or send in your blueprints or sample product for an honest, accurate appraisal of its plastic possibilities.

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ATKINS

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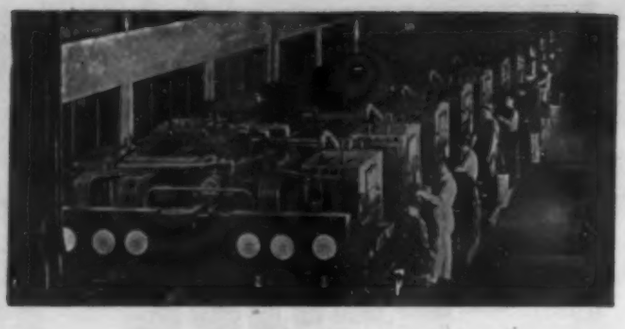
BUTTRESS BANDS

for Plastics Sawing that's
FAR ABOVE PAR

Depend on Atkins "Curled-Chip" Band Saws for cutting all plastics and you can always depend on getting above-average production. That holds good, whether your job calls for profile, contour, curved or cut-off sawing. Difficult patterns pose no problem to this blade with the exclusive "Curled-Chip" teeth in the "Skip-Tooth" design. If you want the saw that cuts faster and cooler over longer cutting periods—that lessens re-finishing because it cuts so smoothly — you want Atkins "Curled-Chip" Buttress Bands. *Write for full details today.*

E. C. ATKINS AND COMPANY
402 S. Illinois Street, Indianapolis 9, Indiana
Agents and Dealers in all Principal Cities the World Over



MODERN **FRENCH OIL**
Presses for Molding Modern Plastics

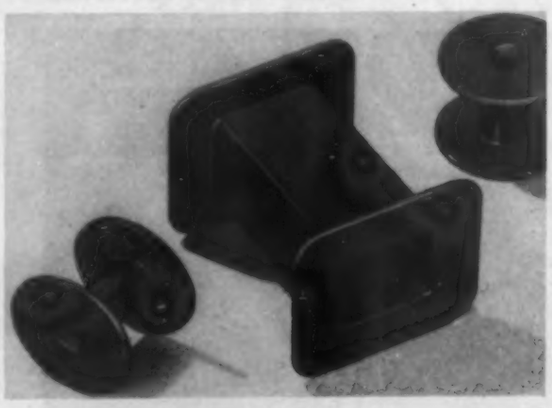
● For accuracy, speed and economical operation that brings increased profits turn to French Oil Hydraulic Presses, the choice of leading plastic molders. Complete self-contained presses with automatic time control that is instantly adjustable. Dependable, modern French Oil presses in sizes up to 1500 tons are the choice of leading plastic molders. Consult French Oil engineers or write for catalog.

THE FRENCH OIL MILL MACHINERY CO.
(HYDRAULIC PRESS DIVISION)
PIQUA, OHIO, U.S.A.

COMPRESSION AND INJECTION

Bobbins...

MOLDMAKERS AND CUSTOM MOLDERS



Tooled to build efficient molds for fast economical production . . . **Experienced** in planning and delivering millions of Customolded parts . . . **Skilled** in meeting precision specifications on difficult operations. Name your Customolding requirements. Midwest will measure up.

Midwest Molding AND Manufacturing COMPANY
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HOPP Plastics

EXTRUSION MOLDING: Continuous lengths, in any form, cut to any length.

INJECTION MOLDING: Small to medium sized objects molded to any desired shape to meet your specifications.

LAMINATING with layers of transparent plastics to hermetically seal printed surfaces against moisture, oil and water.

FABRICATING: Wide variety of sheets, flexible or rigid, dull or glossy finish. Wide color range.

DIE CUTTING to any shape desired, done right on our premises.

PRINTING: We specialize in printing where extremely close register is imperative.

FORMING OF Sheet Plastics to any desired shape.

EXTRUSION MOLDING
INJECTION MOLDING
LAMINATING
FABRICATING
DIE CUTTING
PRINTING
FORMING

THE HOPP PRESS
INCORPORATED
460 W. 34th ST., NEW YORK 1, N. Y.
ESTABLISHED 1893

All Leading Plastics Plants Now Use This

ATLAS Type "E"
High Pressure Reducing Valve

Of course we meet skeptics now and then who say, "In our plant we have a reducing job that is too tough for *any* reducing valve including ATLAS Type E."

To which we reply, "How do you know? Have you tried Type E?" And that usually settles it. They try a Type "E" and to their amazement it handles the job *easily*. Reduces pressures up to 6,000 lb. per sq. in. *without shock*. Water, oil, or air. A truly GREAT valve.

Why Is It So Good?

Because it's made by a concern—ATLAS—that has devoted itself exclusively to regulating valves for nearly a half century. The body of Type "E," for instance, is of forged steel. All internal metal parts are wholly of stainless steel. A formed packing of special material superior to leather is used which is immune to all fluids commonly used in hydraulic machinery. The pressure on the seat is balanced by a piston with the result that variations in high initial pressure have little effect on the reduced pressure. Ask for complete information.

For other ATLAS plastics plant products see the partial list in our ad in the January 1947 issue of MODERN PLASTICS

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
277 South Street, Newark 5, N. J.
Representatives in Principal Cities

Rx for... A FINISH FOR PLASTICS

VARIOUS MOULDERS of plastic articles, such as Toilet Seats—Radio Cabinets—Wash-machine Impellers, etc., required white and pastel finishes for decorative and protective purposes.

PRIMARILY they demanded maximum adhesion without expensive preliminary surface treatment.

DIFFERENT PLASTICS were used—some new, some scrap—colors and surfaces varied. We prescribed a satisfactory finish for each . . .

Write for further particulars on Custom Made Plastic Finishes

BRADLEY & VROOMAN COMPANY
2629 South Dearborn St.
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OUR PROPOSAL TO YOU

Without cost or obligation, we will be glad to have our Laboratory, skilled chemists and technical engineers examine your requirements and submit recommendations for improvement in finish or lowering of costs, without sacrifice of quality.

Cumberland Plastics Granulating Machines

Expressly designed for granulating the various types of plastic materials

Advanced design features enable Cumberland machines to perform at maximum efficiency the special cutting required by plastics materials. Machines are made in two styles: smaller machines No. O, No. ½ and No. 1½ as at right (No. ½ illustrated). Style of large machines as at left with retractable knife block for maximum accessibility (18" Machine illustrated).

Request illustrated CATALOG No. 200

CUMBERLAND ENGINEERING CO.
Dept. A—Box 216, Providence, R. I.

BADGER PLASTICS, INC.

Specialists in

THERMOSETTING EXTRUSION

We invite inquiries for extruded thermosetting tubes, rods, and shapes. The light weight, strength and physical properties of our extrusions make them ideal for textile, electrical, chemical and communications applications.

Open Time Now Available in our injection division. Our skilled staff of engineers has years of experience in producing volume precision work for the automotive, furniture, radio, novelty and premium industries. Send us your blueprints and specifications.

BADGER PLASTICS, INC.
121 N. 8th Street Sheboygan, Wisconsin

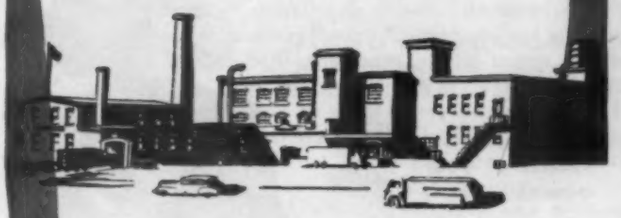
Special types have been developed for each plastic

Pearl Essence

THE MEARL CORPORATION
153 Waverly Place New York, N.Y.

PLASTICS

Scrap



WE BUY

Thermoplastic Scrap—Rejected Molded Pieces—Obsolete Molding Powders—and pay highest prices

WE SELL

Reconditioned molding powders GUARANTEED to fit your needs

WE RECLAIM

Your scrap for you

WE SPECIALIZE in custom grinding, magnetizing, separating and reworking.

CELLULOSE ACETATE • POLYSTYRENE • METHYL METHACRYLATE

A. BAMBERGER

CORPORATION

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PHONE: EVERGREEN 7-3887 • CABLE: CHEMPROD BROOKLYN

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FINDINGS WHAT YOU NEED WHEN YOU NEED IT!

Suppliers for Molders and Fabricators

of

Jewelry
Compacts
Handbags
Luggage
and Dress
Accessories

(Millinery, Shoes, Belts)

WE are known for the wide variety of our line of metal and plastic findings. We have a large assortment of Metal Stampings, Ornaments (including Filigree), Charms, Bead Chain, Buckles, Fancy Wire, Wire Formings, Hinges, Plastic and Metal Beads, Fancy Chain, etc., for every kind of trimming, novelty and decorative use.

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The SPEEDRIVER

An indispensable tool for fabricators of Plastics, Celluloid, Brass, Iron, etc.

Magnetic tip holds drive screw in place for driving. Hardened steel spring action drives it in. Adjustable for light or heavy drive—will not break plastic material while driving the screw.

Durable—Long Lasting—A time and labor saver—Use it once and you will not want to get along without it.

Send for folder.

MS 183 Plastic Pinback Safety Catch
MS 280B Metal Pinback
MS 300 Bead Chain
CHAINS
CURB • CABLE • JACK
BEADS
STERLING, BRASS, ALUMINUM, PLASTIC METALLIZED IN GOLD OR SILVER.

MARTIN M. STEKERT

45 WEST 34th ST., NEW YORK 1, N. Y.

Skill

IS REQUIRED IN *Plastics* TOO

Ski jumpers must have skill to execute a perfect landing, just as our engineers and personnel must be skilled to give your product the maximum quality and sales appeal. Whether it be a new or old product involving the use of custom molded plastic parts, see Franklin first.

Franklin

FRANKLIN PLASTICS DIVISION

Robinson Industries, Inc. - - FRANKLIN, PA.

Plastic Markings

in gold, silver or colors

THE KINGSLEY hot stamping machine is precision-built to produce clean-cut stampings of designs, names and trademarks on soft plastics and other similar materials.

Production speeds up to 800 per hour using unskilled operators.

Send samples and details of your stamping problems.

EASY TO OPERATE

Kingsley STAMPING MACHINE CO.

HOLLYWOOD 28, CALIFORNIA

PROTECT YOUR PRODUCTS DURING SHIPMENT *with*

S·S·White PLASTIC DUMMY SHIPPING PLUGS AND CAPS

HEX. SOCKET TYPE PLUGS FOR N.P.T. PIPE THREADS

PLAIN TYPE PLUGS FOR N.P.T. PIPE THREADS

SHOULDER TYPE PLUGS FOR MACHINE SCREW THREADS

TYPE C CAP NUTS FOR MACHINE SCREW THREADS AND N.P.T. PIPE THREADS

Made of tough, non-brittle plastic. Available from stock molds in a wide range of sizes. Details in *BULLETIN* P-4501. Copy mailed on request.

CONTRACT MOLDING *in all standard thermoplastic and thermosetting materials.*

S.S.WHITE PLASTICS DIVISION

THE S. S. WHITE DENTAL MFG. CO. — DEPT. M, 10 EAST 40th ST., NEW YORK 16, N. Y.

FLEXIBLE SHAFTS • FLEXIBLE SHAFT TOOLS • AIRCRAFT ACCESSORIES
SMALL CUTTING AND GRINDING TOOLS • SPECIAL FORMULA RUBBERS
MOLDED MOUNTINGS • PLASTIC SPECIALTIES • CONTRACT PLASTICS MOLDING

AMERICAN PIPE & CONSTRUCTION CO.
has success with No. ½
BALL & JEWELL SCRAP GRINDER

"We have had success with this equipment and are using it to grind a milled plastic material into a size which is suitable for use in an extrusion machine," says Mr. C. G. Munger, Chief Chemist at American Pipe and Construction Company. Operator is shown inserting scrap into Ball & Jewell Model #½ Rotary Cutter installed with motor drive and special baffled hopper. Note sturdy construction of this machine, which is strong enough to take scrap up to ¾ inch thick. The extra heavy castings, solid tool steel knives, outboard sealed SKF ball or roller bearings that are features of all Ball & Jewell scrap grinders make them standard throughout the plastics industry.
Famous for their speed, efficiency, safety and economy, they pay for themselves in materials saved and reused.

Three interchangeable screens come with every Ball & Jewell scrap grinder, allowing different-sized granulations of scrap material. Simple construction permits quick takedown for cleaning. Send for free catalog.

This is #26 in a series of advertisements showing typical Ball & Jewell scrap grinder installations in the plastics industry.

BALL *and* JEWELL
20 Franklin Street, BROOKLYN, N. Y.
Since 1895, Manufacturers of Patent Rotary Cutters

CHICAGO: Neff, Kohlbusch & Bissel. DETROIT: J. C. Austerberry's Sons. LOS ANGELES: Moore Machinery Co. LOS ANGELES & SAN FRANCISCO: Machinery Sales Co. NEW ENGLAND: Standard Tool Co., Leominster, Mass. ATLANTA, GA.: George L. Berry. ST. LOUIS: Larrimore Sales Co. CLEVELAND 22, OHIO: L. F. Willmott, 3701 Latimore Rd. SEATTLE 4, WASHINGTON: Olympic Supply Co. KANSAS CITY, KANS.: Fluid Air Engineering Co. MINNEAPOLIS 20, MINN: Chas. W. Stone. CINCINNATI, OHIO: Index Machinery Corp. DALLAS, TEXAS: Perry Machinery Corp. AUSTRALIA and NEW ZEALAND: Malcolm A. Mac Gregor, SYDNEY. NEW YORK 16, N. Y., Foreign Distributors: Omni Products Corp., 40 East 34th St. STOCKHOLM, SWEDEN: Ingenjorsfirman Teknova. CANADA: Williams & Wilson, Ltd., Toronto & Montreal. HAWAIIAN ISLANDS: Hawaiian Sales Service, P. O. Box 3498, Honolulu, 11, T. H.

So Simple Anyone can
ENGRAVE
on Plastic and Metal

NEW HERMES PORTABLE

The handy, accurate machine that every plant NEEDS for speedy production lettering of name plates, small panels, novelties, serial numbers, part numbers, etc.

NEW HERMES, INC.
13-19 University Place • New York 3, N. Y.
Several choice territories still open for representatives

YOUR *plastic problems are not UNUSUAL to us*

End trial and error methods . . . let our 60 years of plastic know-how show you the way. Quotations submitted without obligation.

INJECTION AND EXTRUSION MOLDING
MECHANICAL PRESS FORMING
A COMPLETE DESIGNING SERVICE
MODERN TOOLROOM SERVICE
MACHINING, ASSEMBLING AND FINISHING
FABRICATION OF SHEET MATERIALS

EST. 1887
E. B. KINGMAN CO.
LEOMINSTER • MASS.

PLASTICS

PRECISION MOLDED IN LARGE VOLUME at DICKTEN & MASCH

In our new modern plant, one of the most up-to-date in the midwest, your requirements are given special attention by experts trained to exactness in the most difficult molding.

WE DESIGN AND FABRICATE YOUR MOLDS

Your product is engineered from start to finish by an able, experienced organization. Skilled men design and completely fabricate your molds.

For plastic molding in all compression and transfer molding materials, write, wire, or call us — today!

AT YOUR SERVICE NOW

DICKTEN & MASCH Mfg. Co.

Plastic Molding

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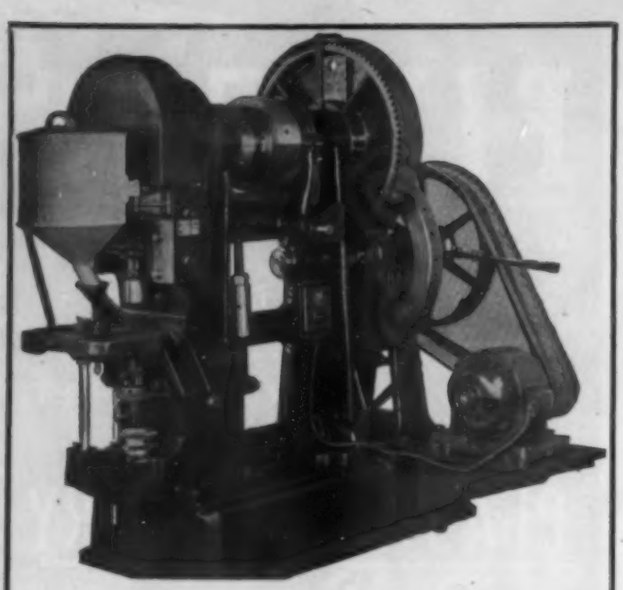

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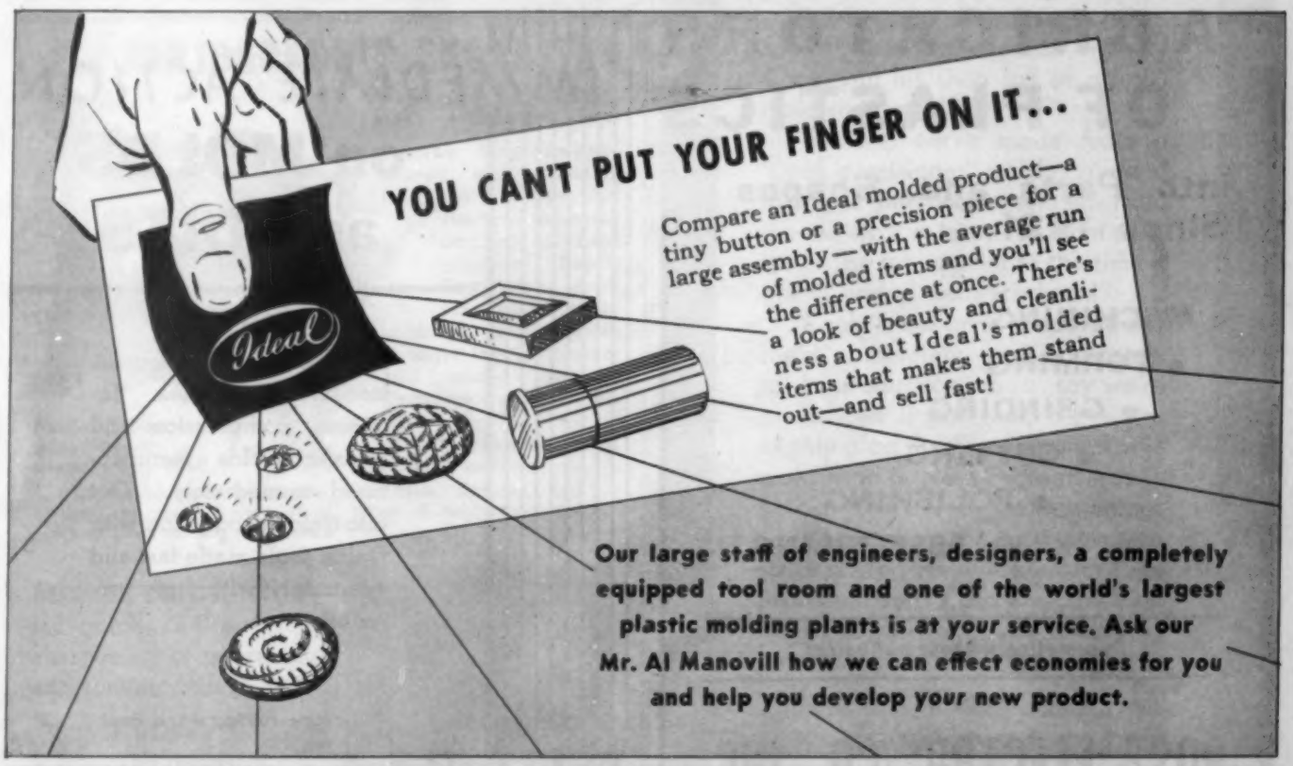
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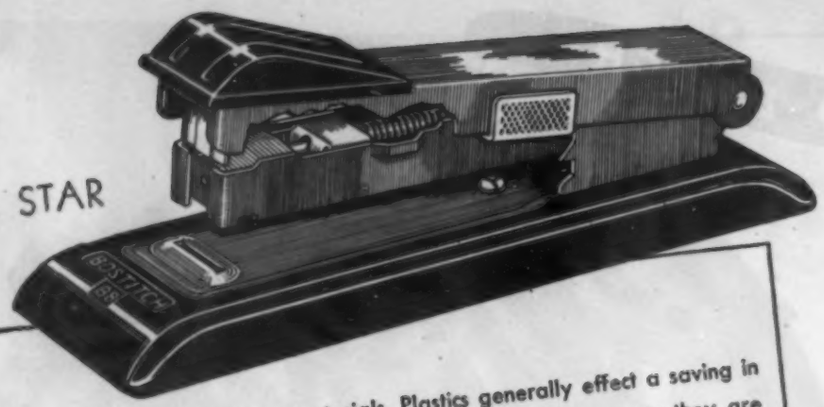

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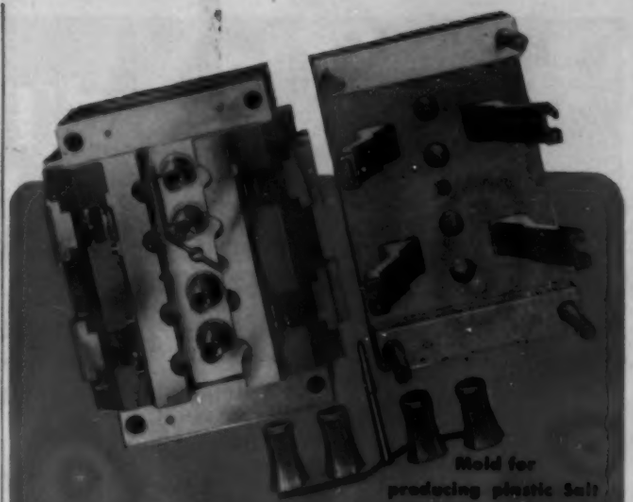

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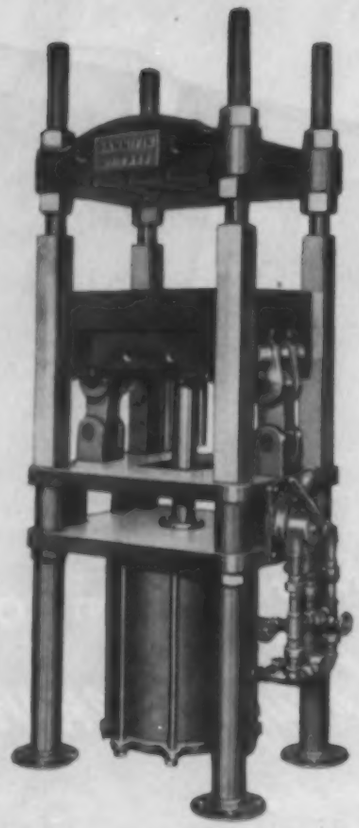

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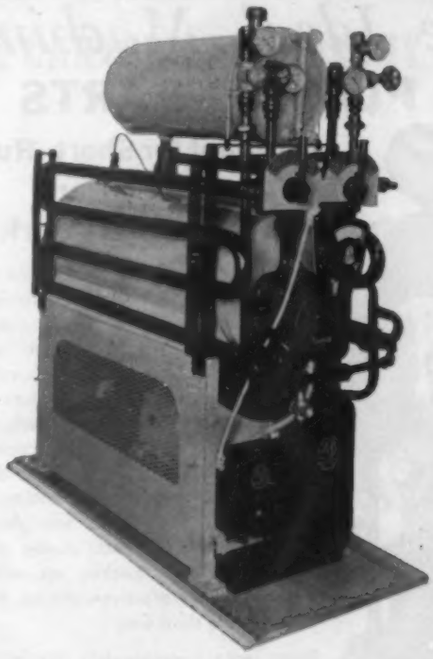

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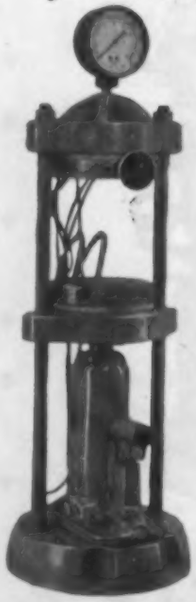

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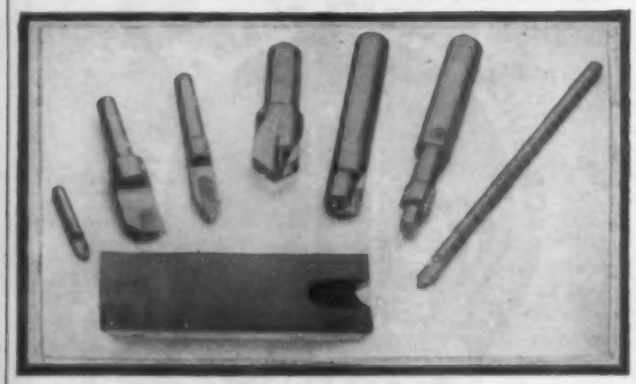

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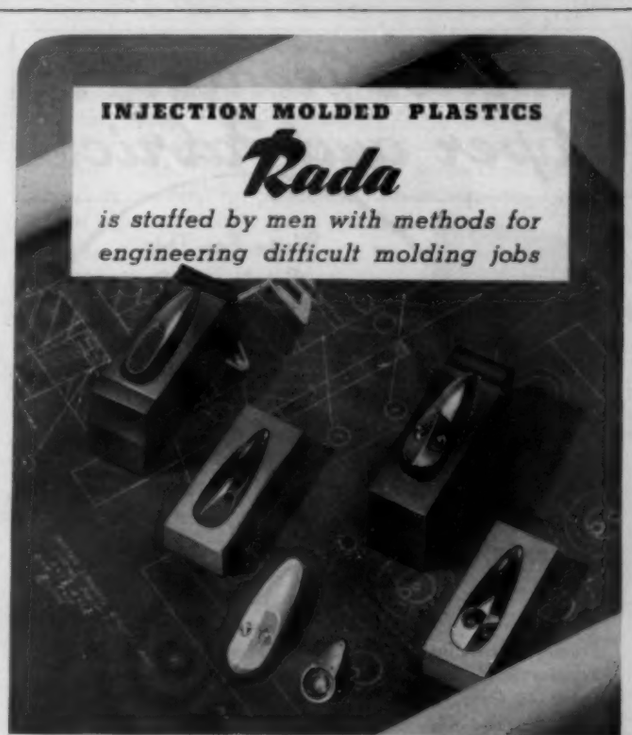

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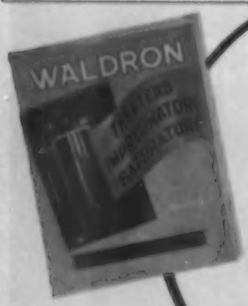

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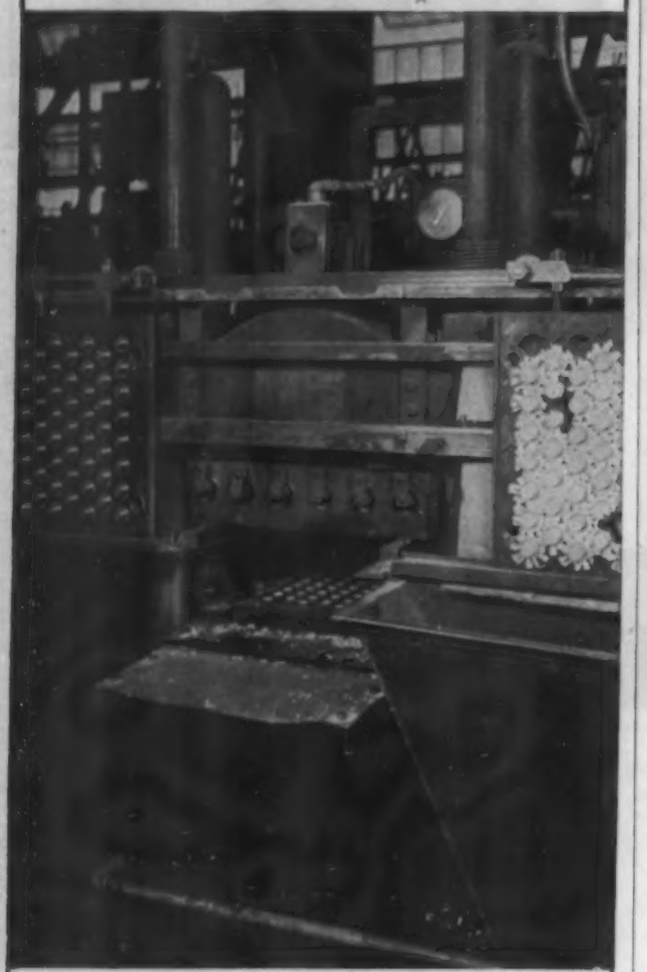

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★ *Announcing*

THE PRODUCTION OF PHENOPREG X-CREPE

Our Plastics Division is pleased to announce the production of PHENOPREG X-CREPE grades as an important addition to their line of resin impregnated fabric and paper grades.

Resin impregnation of X-CREPE materials is being discontinued by Cincinnati Industries, Inc. in order to specialize in the production of X-CREPE as a basic material and in order to concentrate its activities on certain converted items not connected with the molding or laminating industries.

PHENOPREG X-CREPE, phenolic resin impregnated X-CREPE paper with all-directional stretch, is suitable for three dimensional contour molding, molding powder reinforcement, etc. It will be found to do a particularly good job on any item which requires the strength of a laminated construction in a compound shape.

★ We are now producing the following grades:
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Available in rolls, sheets, die cut patterns or coil charges.

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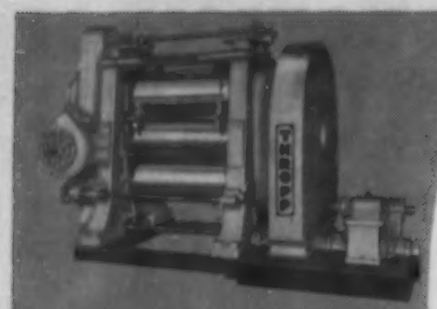

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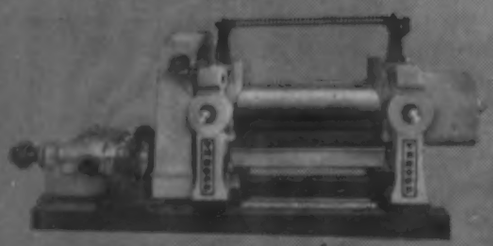

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For economy as well as functional beauty we chose Polystyrene for this injection molded radio part, . . . BUT the two-tone effect—gold-colored lettering sharply abutted against a maroon-sprayed area — seemed impossible to manufacture by mass production methods.

Then Felsenthal engineers came up with a specially-built mask and special paint that permitted high-speed spraying and painting—yet left the gold letters clean and sharp to a hairline. Here is another case, again illustrating the point: "If you can lay it out on blueprints, Felsenthal can put it out in plastics."

Est. 1899

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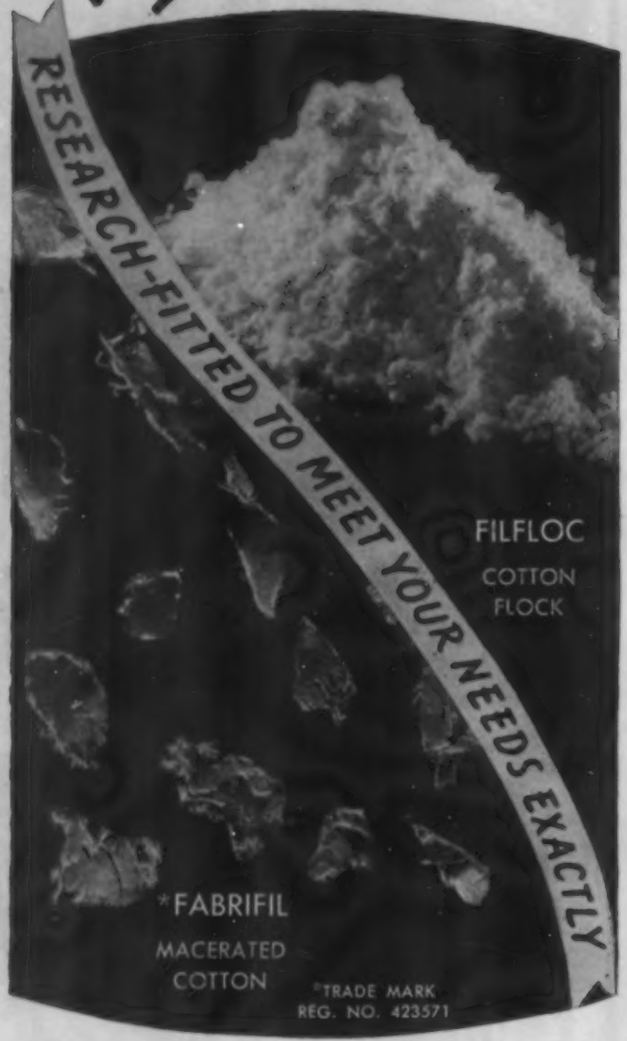

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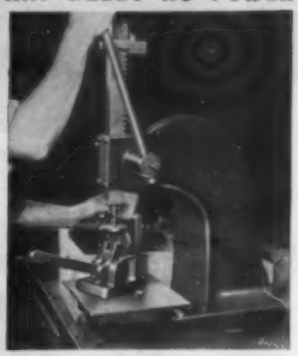

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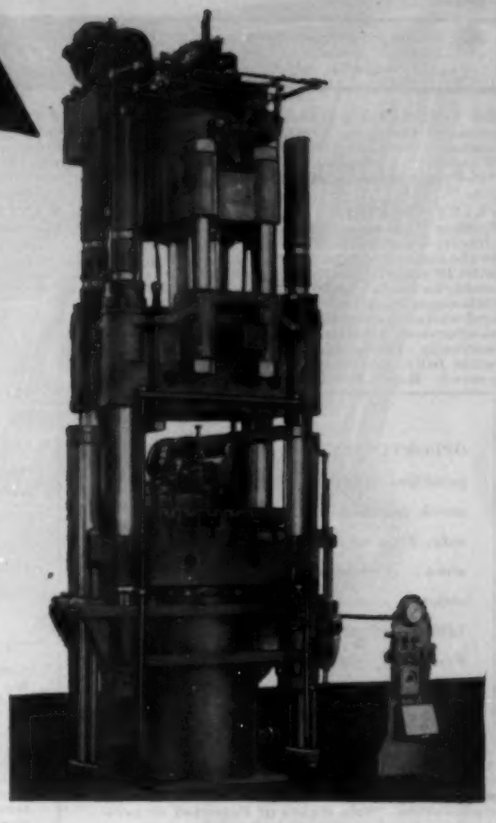

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Built in a range of sizes from 100 to 2000 tons, WILLIAMS-WHITE Presses for compression molding are designed to meet your particular requirements. The use of an individual pumping unit permits close control of the cycle, by hand or fully automatic, with provision for breathing or gassing.

The model illustrated is a 500-ton press with a platen area of 43 x 24 in.; daylight opening, 30 to 47 in.; stripping capacity, 50 tons; closing speed, 110 in. per minute; full pressure travel, 5 in. per minute with the 10 HP motor drive. Top and bottom knockouts. In addition this press is fitted with a complete pressure assembly in the top head.

WILLIAMS-WHITE & Co.

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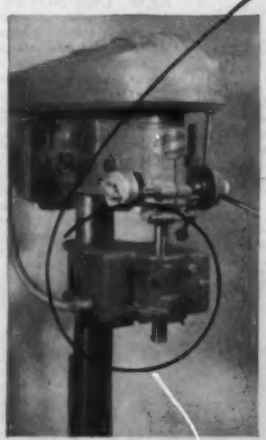
ON YOUR OWN DRILL PRESS!

Precision ground lead screw provides accurate, controlled tapping from 0-80 to ⅞".



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2. Hardened, precision ground lead screws.
3. Instantaneous emergency reverse.
4. Complete automatic cycle.
5. Accurate control of depth—accuracy to .010.
6. Foot control frees operator's hand for loading.
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FOR SALE—1—12" x 12" Press 7" Ram, Steel Heated Platens and Hand Pump attached; 1—24" x 24" Adamson, 10" ram, 2-opening Hydraulic Press; 1—24" x 24" Farrell, 10" ram, 2-opening Hydraulic Press; 1—30" x 30" D & B, 2-open, steel heated Platens 12" ram; 2—La Pointe Hydraulic Pumps, 150 G.P.M.—2000 lb. pressure direct motor driven to 125 HP AC motors; 1—French Oil Hydropneumatic Accumulator; 1—14" x 24" Press, 9" ram; 6—Hydraulic Presses, 30" x 20", 12" x 14"; Dry Powder Mixers; Pulverizers, Grinders, etc. Send for complete list. Reply Box 1545, Modern Plastics.

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I can provide large, patented, low cost hydraulic presses to inject from 2 pounds to 20 pounds per shot. Machines mold thermosets, thermoplastics, rubber, the light metals, etc.
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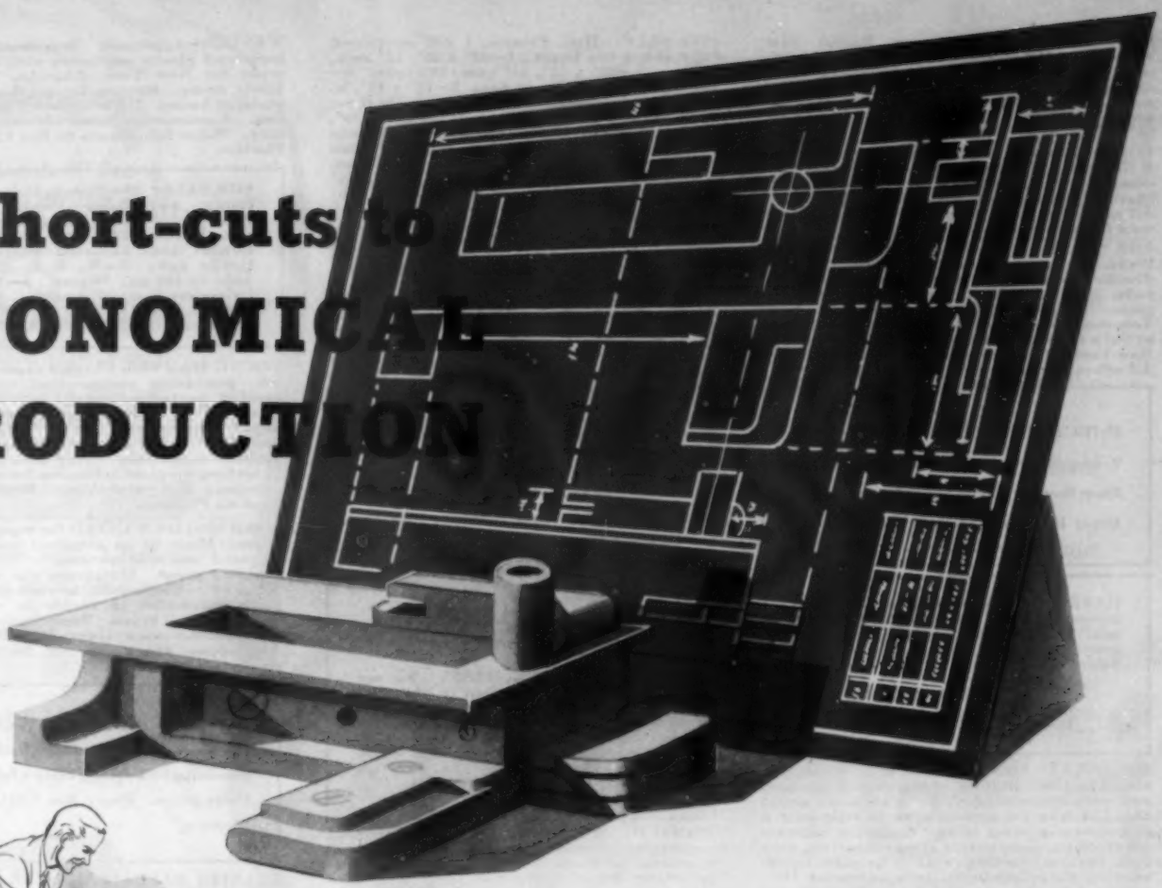

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RECENTLY FORMED COMPANY experienced in the handling of resins and plastics, and well-acquainted with the industry about the Los Angeles area desires to represent a few manufacturers of raw materials relating to molding, laminating, impregnating, surface coating, casting, etc. The men representing these products have advanced University degrees in chemistry, engineering, and business administration. Reply Box C249, Modern Plastics.

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WE HAVE STEEL SHEETS from 16 to 30 gauge. Will trade for general purpose phenolic molding compound, any color. Ivory urea also acceptable. Reply Box C257, Modern Plastics.

FOR SALE: Hyd. Presses, 1 self contained fully aut. 5 ton Denn., 1—36" x 36", 14" ram, 200 ton, 1—36" x 52", 14" ram, 385 tons; 5—12" x 12", 7½" rams, 50 ton; 2—15" x 15", 8" rams, 75 tons; 1—15" x 15", 10" rams, 100 tons; 3—19" x 24", 10" ram, 78 tons; 3—13" x 19", 12" ram, 100 ton; 1—20" x 20", 13" ram, 200 tons with pullbacks; 3—23" x 17½", 8" ram, 75 tons with pullbacks; 1—16" x 17", 8" ram, 75 tons, 1—22" x 15", 8" rams, 75 ton; 7—12" x 13", 6½" ram, 50 ton; 4—8" x 9½", 4½" ram, 20 ton; 3—1000 ton 29" ram presses; 3—2043 ton presses, 54" ram; 1—24" x 30", 550 ton, 15" ram; 1—20" x 20", 10" ram, 100 ton; Pumps: 1—HPM triplex 1½ GPM 2500#, 1—Rob. Dup. 1½ GPM, 4000#, 1—Gould Trip. 12 GPM 1250#, 1—Worth 2½ GPM 4000#, 1—Worth. Trip. 12 GPM 2500#, 1—Elmes Dup. 1½ GPM 2850#; Preform Presses, Stokes Model F single punch. 1—DDS—2 Stokes, 1—Kux ICS Extr.; 1—Royle Perfected #3 cont. motor bedplate, 1—Housatonic 6" worm, Mills, Calenders, Mixer Laboratory Presses, Accumulators, Hydropneumatic and weighted types, etc. HIGHEST PRICES PAID FOR YOUR USED EQUIPMENT. Universal Hydraulic Machinery Company, 285 Hudson Street, New York City 13.

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2 Sets of Injection Molding Dies for 4½" and 5½" compact, round. Write: L & M Corp., Monroe & Wells, Chicago, Ill.

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WANTED: Sales Engineer fully acquainted with markets for extruded plastic rods, tubes and special functional shapes in industrial and sundry fields. A solid company. New York area with fine extrusion equipment and engineering skill ready to make a top flight man an attractive proposition. Write fully about yourself in complete confidence. Members of our organization are aware of this ad. Reply Box C259, Modern Plastics.

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Also available in 1¼" and 1½".

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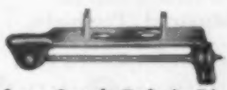

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The *perfect* mirror is not only clearer and has more reflectability than any glass mirror, but it is unbreakable too!

Why? BECAUSE IT IS MADE OF PLEXI-GLASS!

Mirro-Plex Inc. features the 5 illustrated unbreakable plastic mirrors designed to fit all standard handbag and cosmetic needs.

Mirro-Plex will also supply easy-to-cut 18 x 18 inch plastic mirror sheets in 1/16 to 1/4 inch thicknesses.

Mirro-Plex specializes in Plating on Plexi-Glass. We will plate your plexi-glass for you.

MIRRO-PLEX, INC.
160 FIFTH AVENUE, N. Y. C. • WA 9-3030
MANUFACTURERS OF THE PERFECT MIRROR

Accurate Tubes and Rods by

CONTINUOUS MOLDING

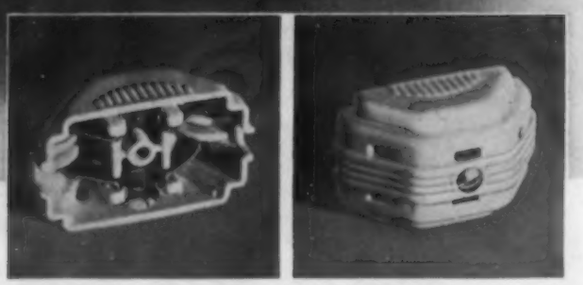
Do you need tubes or rods completely free from even the slightest bulges or hollows? We are making them in high finishes to extremely close tolerances in diameters from ½ inch to 2 inches.

By using the continuous molding process we can furnish them in any lengths. For toys, lamps, display fixtures, modernistic furniture and industrial uses where appearance and dimensional accuracy are important, you can profit by consulting our engineers.

YARDLEY *Plastics Co.*

142 PARSONS AVE. COLUMBUS 15, OHIO

Extruders of SARAN, CELLULOSE ACETATE, BUTYRATE, POLYSTYRENE, STYRALLOY and VINYLS. Also Injection and Compression Molding.



Triple Convenience Outlet courtesy Huppert Mfg. Co., Newark, N. J.

AN OUTLET FOR GREATER SALES

The Huppert Triple Convenience Outlet is a perfect example of Worcester Moulded large scale custom injection facilities applied to a small part. Precision moulding of this fixture in tremendous volume provides for precision electrical fittings so that the single wood screw, when tightened, produces a contact between pin point conductors and terminals without wire stripping, and the four sharp moulded points firmly secure the outlet to baseboard or other support. In designing plastic parts or products, you, too, can count on Worcester Moulded to help you develop an outlet for greater sales and profits.

Custom Injection Moulding

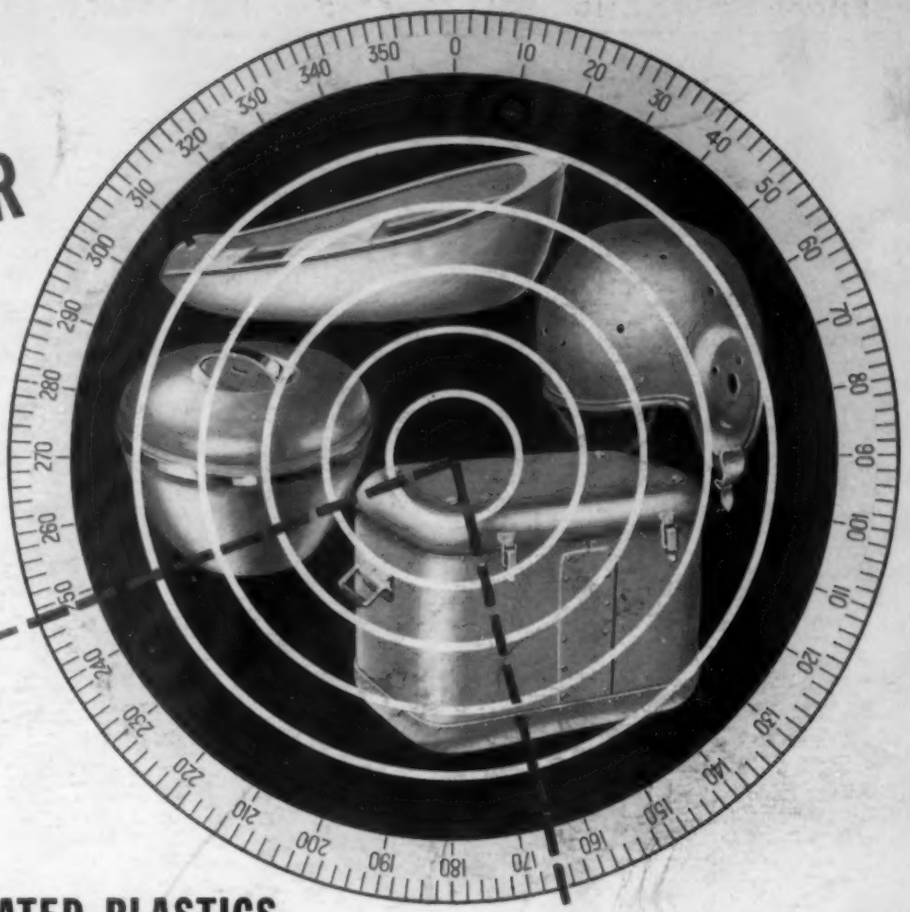
WORCESTER MOULDED PLASTICS CO.

14 HYGEIA STREET, WORCESTER 8, MASS.

17 East 42nd St., New York 17, N. Y.

130 West Chippewa St., Buffalo 2, N. Y.

How RADAR spotted postwar targets



...FOR LAMINATED PLASTICS

One of radar's earliest problems has brought about one of the most far-reaching postwar developments in plastics! The problem: a streamlined, light-weight, all-weather housing for bulky antennas. The answer: low-pressure laminating of plastic materials!

Everyone is familiar with the bulging "radomes" on many of our wartime aircraft. Those big shapes, with compound curves covering large areas, could never have been turned out in quantity by conventional molding methods. Low-pressure laminating of duck and glass cloth layers impregnated with BAKELITE resins solved the problem—and spawned a host of postwar applications!

Big shapes...complex forms containing deep undercuts... these and other projects that are well-nigh impossible by ordinary plastic molding techniques are made comparatively easy by this new war-born process.

Industry will find many uses for low-pressure laminates—thanks to their high dielectric strength, dimensional stability, mechanical strength and other desirable properties that are dependent upon choice of base materials and the correct BAKELITE laminating varnish. They permit simple molds—color may be incorporated—they may be formed in the flat and *postformed* in a wide variety of shapes—they are the *economic* answer to many product design problems.

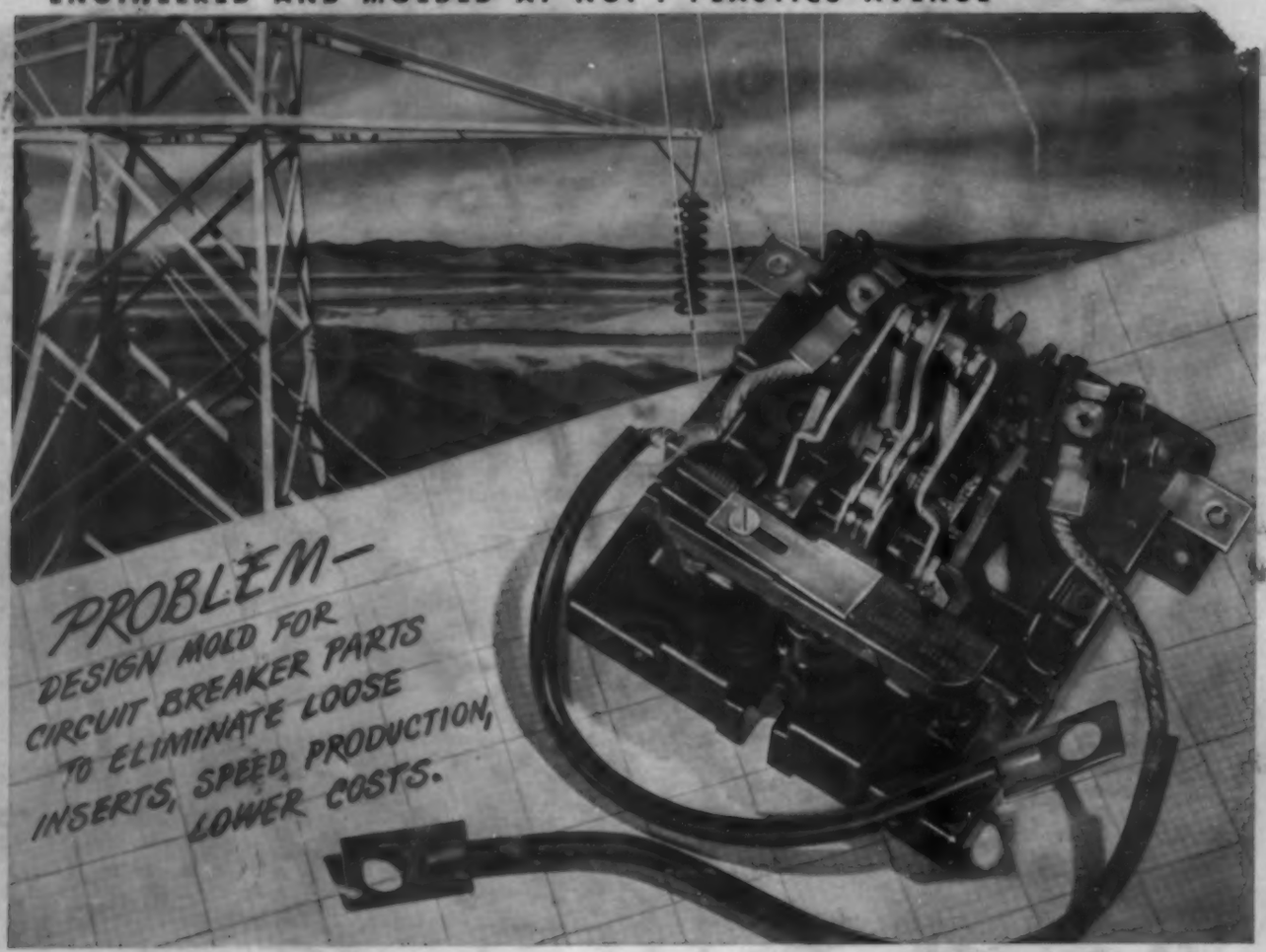
Write Department 1 for further information on low-pressure laminating-molding.

TRADE-MARKS

BAKELITE PLASTICS

BAKELITE CORPORATION, *Unit of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

ENGINEERED AND MOLDED AT NO. 1 PLASTICS AVENUE



Power gets a break from plastics

● Circuit breakers—watchdogs of the power lines—are now made faster and more efficiently, thanks to General Electric plastics engineering. G-E designers developed new and unique molds for major circuit breaker parts, eliminating the need for loose wedges to create necessary cross holes and projections. Results? Circuit breaker production speeded and costs reduced.

Whether you make compacts or machinery, when you think of plastics, think of General Electric—the world's largest manufacturer of finished plastics products. General Electric's *complete* plastics service is equipped to carry your job through from drawing board to delivery platform. G. E. works with *all* types of plastics. It can recommend, without bias, the best one for your particular requirements.

For more information, write Plastics Divisions, Chemical Department, 1 Plastics Avenue, Pittsfield, Mass.

G-E Complete Service—Everything in Plastics

BACKED BY 52 YEARS OF EXPERIENCE. We've been designing and manufacturing plastics products ever since 1894. G-E research works continually to develop new materials, new processes, new applications.

NO. 1 PLASTICS AVENUE—complete plastics service—engineering, design and mold-making. Our own industrial designers and engineers, working together, create plastics parts that are both scientifically sound and good-looking. Our own toolrooms are manned by skilled craftsmen—average precision mold experience, 12 years.

ALL TYPES OF PLASTICS. Facilities for compression, injection, transfer and cold molding . . . for both high and low pressure laminating . . . for fabricating. And G-E Quality Control—a byword in industry—means as many as 160 inspections and analyses for a single plastic part.

GENERAL ELECTRIC

CO 47-260

EVERYTHING IN Plastics

GENERAL ELECTRIC PLASTICS FACTORIES ARE LOCATED AT SCRANTON, PA., MERIDEN, CONN., COSHOCTON, OHIO . . . FORT WAYNE, IND. . . . TAUNTON AND PITTSFIELD, MASS.